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Immunity in Human Subjects Artificially Infected with Influenza Virus, Type B*

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EPIDEMIOLOGICAL evidence indicates that immunity to influenza is acquired by the human subject, presumably as the result of infection, but its duration has not been clearly established. During the winter of 1942–1943 an effort was made to gain further information on this point by studying the reaction of a group of individuals to induced infection with influenza virus, Type B, and determining the response of the same subjects to the same virus four months later. The present report comprises the evidence obtained.

MATERIAL AND METHODS

Virus—The Lee strain [1] of influenza virus, Type B, was used throughout. The extra-embryonic fluid from infected hen's eggs, 48 hours after inoculation, was harvested and concentrated in physiological salt solution by the procedure of Francis and Salk.[2] For the first exposure, concentrate was used from the 20th and 21st egg passages after 8 passages in ferrets and 137 in mice. The material had been stored in the refrigerator at 4° C. for a month prior to use. In the second test similar material from the 34th and 35th egg passages was used after 7 to 16 days' storage at 4° C.

The titer of virus in the two lots of concentrate was determined by agglutination of chicken erythrocytes and by

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the intranasal infection of mice. Hemagglutinin titers were determined by a modification of the method described by Hirst.[3] Five-tenth ml. volumes of twofold dilutions in physiological salt solution of the fluid to be tested were mixed with equal volume of 0.25 per cent suspension of washed fowl erythrocytes. The test was allowed to stand at room temperature for 1½ hours, when all the cells had settled, and then read by viewing the pattern formed at the bottom of the tubes. The end point was considered to be the highest dilution of virus which completely agglutinated all the cells. The titer is expressed in terms of final dilution of virus, after addition of cell suspension.

The titers of the two lots of material are as follows:

		Mouse Infectivity		
	R C A	10^{-4}	10^{-5}	10^{-6}
Lot 1	20,000	7,7,9	9, ++++, +++	+ ± ±
Lot 2	12,800	6,6, ++++	++++, ++, ++	+ + ±

Numerals indicate day of death after inoculation
± to ++++ indicate different degrees of pulmonary consolidation at autopsy on 10th day

Method of Infection—The nebulizers used contain glass baffles against which the material to be sprayed is blown. The result is almost a dry mist which condenses on a cold surface with fine, uniform coating. The instruments were attached by rubber connections to a tank of compressed air and 10 lb. pressure was applied. Under these conditions the different nebulizers delivered 0.1 to 0.17 ml. per minute. Glass nasal adapters were attached to the dispensing end of each nebulizer and were inserted into the nostril. The spray was inspired by the subject through one nostril for 2½ minutes and then for the same time through the other nostril. In the process of spraying, the patient exhaled a large proportion of the material which settled as a fine cloud. The adapter was washed with antiseptic solution before use by another subject. The spraying was done in a small treatment room off the corridor leading to a large day room. After spraying, each subject was permitted to return to the large room where he mingled with the controls. Although the latter did not enter the treatment room, there was opportunity for atmospheric interchange between the spray room and the day room where both treated and control individuals congregated.

Subjects — The individuals participating in the clinical trial were residents of one ward of the Ypsilanti State Hospital, Ypsilanti, Mich. They were ambulatory males, many of them in the older age groups, who were confined to the ward except for a daily walk outdoors or occasional tonsorial expeditions. Since no preliminary information as to their serological levels was obtained, no selection on this basis occurred. There had been no evidence of heightened incidence of respiratory disease in the previous 8 months. All were carefully examined for signs of acute respiratory illness before being included in the group.

Clinical Observations—At the time of the first spray, records of rectal temperature were begun the day after inoculation and continued until the temperature reached normal. In many instances satisfactory stories of the individual's symptoms could not be obtained but attendants familiar with the customary behavior of the subjects were able to recognize significant modifications in this respect.

Previous to the second test, temperatures were taken *per os* for 2 days; thereafter rectal temperatures were

taken. In addition, from 9 men receiving virus a second time and from 9 receiving virus for the first time, leukocyte counts were obtained on the day before and the 2 days succeeding the spray.

Laboratory Studies — Venous blood was collected from each individual immediately before and 14 to 16 days after spraying. The sera were examined at one time for the titer of antibodies to the Lee strain of virus, using a modification of the agglutinin-inhibition test of Hirst.[4] The modified test * involves the use of a 0.25 per cent suspension of fowl erythrocytes in which the serum dilutions are made directly and the result is read by the sedimentation pattern obtained after complete settling at room temperature. To 0.5 ml. dilutions of the serum in the 0.25 per cent red cell suspension is added 0.5 ml. of virus dilution corresponding to twice the agglutinin titer, thus giving a mixture which contains one unit of hemagglutinin. The end point chosen is the last tube showing complete inhibition of agglutination and is expressed in terms of the final serum dilution, after the addition of virus. The lowest serum dilution tested in the routine test was 1:32, since significant changes in titer are usually well above this level. However, in a few instances lower dilutions were tested.

Throat washings were obtained 48 hours after inhalation from half the individuals sprayed in the first test but, owing to an accident, were rendered unsatisfactory for conclusive study. No virus was detected in samples examined for the presence of red cell agglutinins or tested by ferret inoculation. In the second experiment garglings were collected 24 hours after the spray from 19 receiving a second inoculation, from 10 receiving their first exposure and from 2 untreated controls. The samples were kept on dry ice until tested 10 days later. Each specimen was injected into the nostrils of 5 anesthetized mice which were reinoculated with sterile broth by the same route 4 days later. All animals were sacrificed on the 11th day and their lungs examined for virus lesions. A few samples were also examined for their capacity to agglutinate chicken's erythrocytes. The results are discussed in the text.

Dissemination of Virus—At the time of the second spraying experiment, 10 mice in a box of wire mesh were placed in the room where the inhalations were administered. Another set of 10 was placed on the floor in the ward where the men congregated after spraying. They were kept in these locations for 4 hours and then transported to the laboratory. Two days later, half the mice of each group were inoculated intranasally with sterile broth, and all were observed for signs of infection with influenza virus.

EXPERIMENTAL

INFECTION OF HUMAN SUBJECTS WITH INFLUENZA VIRUS, TYPE B

Clinical Evidence—On November 28, 1942, 60 individuals inhabited the ward. Thirty were designated to serve as untreated controls; the remaining 30 were divided into three groups of 10. The first group was sprayed with virus which had been concentrated and then diluted to the strength of the original material; the second, with virus concentrated twofold; the third group received virus which had been concentrated tenfold. In the next 24 hours, 27 of the 30 individuals receiving the sprayed virus exhibited fevers of 100° F. or greater. In 20 instances the temperature was 101° F. or greater. The data presented in Table 1 indicate that the severity of febrile reaction was somewhat related to the amount of virus received. Thus, 6 of 10 receiving the smallest dose had temperatures of

* Details of the procedure are soon to be published.

TABLE 1

Febrile Response to Spray with Different Doses of Influenza Virus, Type B

		Maximal Temperature (per rectum)			
Group	*Dose*	*<100° F.*	*100°–100.9° F.*	*101°–101.9° F.*	*102° + F.*
1	Unconc.	1	5	1	3
2	2 x Conc.	1	2	3	4
3	10 x Conc.	1	0	2	7
	Total	3	7	6	14

less than 101° F. whereas, 9 of the 10 given the largest concentration of virus had fever of 101° F. or greater. The temperatures of those receiving the intermediate dose were more widely distributed.

From 14 subjects in the series there were either no complaints or information was not obtainable. Among the remaining 16 the following symptoms were noted:

Chills or chilliness	14
Loss of appetite	9
Nausea	5
Malaise	4
Headache	2
Nausea and vomiting	2
Body aches	1

Seven of the patients took to bed. It should be observed that coryza, sore throat, and productive cough were essentially absent.

Physical examination revealed little. No evidence of pulmonary involvement was noted.

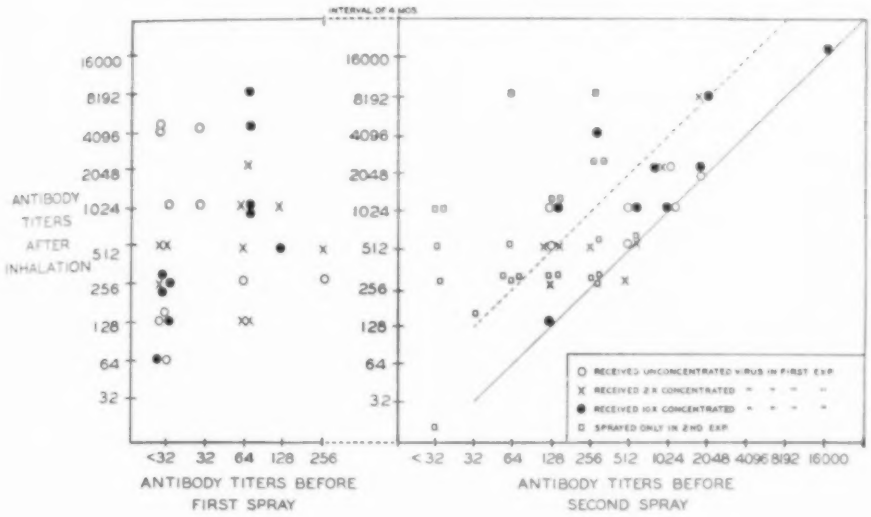
The period of illness was brief. In all but 6 instances the temperature reached normal on the 2nd day; in 5 cases on the 3rd day and in 1 case on the 4th day. With the subsidence of fever, symptoms disappeared and the patients rapidly returned to their customary states of activity and appetite. In general, the symptoms seemed to be somewhat proportionate to the febrile reaction but 2 of the individuals who had no febrile reaction were among those with most definite complaints. Patients with various degrees of illness, apart from fever, were divided in all groups though a tendency to more pronounced symptomatology was observed in those with the larger doses of virus.

Antibody Titers—The serological responses measured by the inhibition of erythrocytic agglutination are shown in the tables and charts. In 26 of the 30 individuals a fourfold or greater rise in titer of antibodies was noted; two of the four failures occurred in the only 2 subjects with initial titers as high as 256. At the beginning of the experiment titers greater than 64 occurred in only 4 instances, while 2 weeks later only 2 individuals had titers as low as 64 (Chart 1). There was no discernible relation between the height of fever or the dosage of virus and antibody response. Those with normal temperatures and those with the milder degrees of fever after the weakest dose of virus responded equally as well as those who had the highest temperatures after the largest doses of virus. The mean titers before and after spraying were 48 and 1,516, respectively, in those receiving the unconcentrated virus; 46 and 1,581 in those receiving virus concentrated tenfold; 75 and 659 in those receiving the twice concentrated material. In 11 individuals with temperatures of 101° or less, the mean titer was 54 before spraying and 1,059 afterward, while the mean titers in 19 individuals with temperatures of 101.8 or greater were 56 and 1,336, before and after spraying, respectively.

The distribution of titers at the onset was scarcely diffuse enough to gain a satisfactory impression of relation be-

CHART 1

ANTIBODY TITERS BEFORE AND AFTER INHALATION OF TYPE B INFLUENZA VIRUS



tween antibody levels and clinical response. Moreover, three different concentrations of virus were employed. Nevertheless, all ranges of reaction were observed at any one initial level of antibodies (Chart 2). For example, of the 14 individuals with the lowest measured titer of less than 32, the recorded maximal temperatures varied from normal to 103.6°. Within the limited scale available the antibody level at the onset of the experiment appeared to have little relation to the extent of the fever which ensued.

Contacts—Among the 30 individuals selected as untreated controls, temperatures were not recorded but no recognizable signs of illness were noted. Nevertheless, serological studies revealed that 11 of them had developed in the period of 14 days an increase to at least four times the original antibody titer so as to indicate that infection had occurred. Three others had twofold rises in titer (Table 2).

TABLE 2

Positive Serological Responses among Contact Controls—First Series

Subjects	*Antibody Titer—Before*	*Antibody Titer—After*
C2 ac	64	>1,024
C5 jf	64	256
C6 bg	64	512
C4 tl	16	64
C10 pm	16	64
C12 cr	64	1,024
C15 rs	<32	128
C29 wt	<16	64
C22 ow	32	2,048
C24 sw	128	2,048
C25 jw	16	64
Dr. hpl	64	1,024

One physician who had watched the spraying procedure experienced generalized aching, pharyngeal irritation, nausea, and a temperature of 99.4° the day following exposure. He subsequently developed a high antibody titer.

The observations clearly indicate that the virus became distributed in the environment so that individuals occupying the quarters in which the spraying was done and mingling with subjects purposely given the spray, underwent in-

fection which was not detected by ordinary observation. Here again infection was not limited to contacts with the least antibody titers but was distributed over the range present in the control group.

SUMMARY

As a result of intranasal spray with influenza virus, Type B, a mild illness ensued. The disease was characterized by an incubation period of 10 to 24 hours; the onset was most commonly accompanied by chilly sensations, aching, loss of appetite, and nausea. The absence of respiratory symptoms or signs was notable. In one-fourth of the subjects the illness was sufficiently severe to put the individual to bed. Twenty-seven of 30 subjects had fever of 100° or greater in the first 24 hours; two-thirds had temperatures of 101° or higher. In the majority, signs and symptoms of illness had disappeared by the 2nd day after inoculation. The height of fever appeared to be more closely related to the amount of virus received than to any single level of antibodies present. All but 4 subjects had at least fourfold rises in antibody titer following the inhalation irrespective of the amount of virus received or the severity of the febrile reaction. Of 30 untreated controls, 11 developed significant serological changes indicating infection incurred while residing in the same quarters.

REINFECTION

In the latter part of March, 1943, 65 subjects on the same ward were available for study. Three groups were formed. The first consisted of 24 of the 30 subjects who had received virus in November. The second group comprised 10 individuals who had served as untreated controls in the first experiment and 13 new arrivals on the ward. A third group made up of 2 individuals previously sprayed, 9 of the earlier controls, and 7 new arrivals, represented untreated controls. Temperatures were taken by mouth on the 2 days preceding the spray and subsequently by the rectal route. Efforts to gain information of clinical symptoms and signs were intensified. On March 29, 1943, each of the 47 individuals in the first two groups received an intranasal spray of the Lee strain of Type B influenza virus, concentrated tenfold, for 5 minutes.

Clinical Response — Symptoms and fever first occurred within 12 hours of the exposure and in 24 hours the effect was at its height. Essentially the same symptoms were noted by those given virus the second time and by controls receiving their first inoculation. They were most prominent again in individuals with highest fevers.

	Resprayed	*Sprayed Controls*
Chilly	8	7
In bed	4	8
Headache	4	7
Malaise	3	2
Anorexia	2	3
Cough	2	2
Bodily aches	1	3
Nausea	1	2
Dizzy	0	3
Sore Throat	0	3
Runny Nose	0	1
Vomiting	0	1

Thirteen of the reinoculated and 14 of the sprayed controls had definite symptoms; 4 and 8, respectively, were in bed. In most instances the illness subsided 24 to 36 hours after inhalation, but in a few cases temperatures remained elevated until the 3rd day.

Among the 24 individuals tested for immunity by reinoculation of virus, 21 developed temperatures of 100° or higher, as did all 23 of those sprayed for the first time. However, 19 (82.6 per cent) of the latter developed fever of 101° or greater while only 9 (37.5 per cent) of the reinoculated group reached that level (Table 3, Chart 2). The rapidity with which fever developed

CHART 2

RELATION OF ANTIBODY TITER AND FEBRILE RESPONSE TO TYPE B INFLUENZA VIRUS

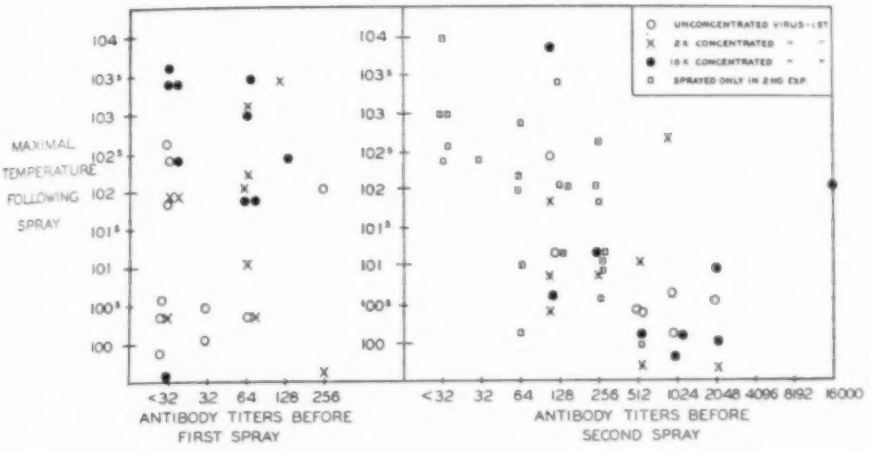


TABLE 3

Febrile Responses of Subjects Resprayed with Influenza Virus, Type B, and Controls

Group	No.	Maximal Temperature (per rectum)			
		<100° F.	100°–100.9° F.	101°–101.9° F.	102°+ F.
Resprayed	24	3	12	5	4
Sprayed Controls	23	0	4	5	14
Contact Controls	18	15	2	1	0

and declined was essentially the same in both groups.

No sharp change in the leukocyte count occurred. The mean count of individuals before spraying was 12,300 and on the 1st and 2nd days after spraying was 11,300 and 8,900, respectively. No difference was observed in the trends exhibited by those receiving a first or second inhalation of the virus.

It becomes quite evident that 4 months after infection with influenza virus, Type B, inhalation of the same virus induced in the same group of individuals illness clinically similar to that which followed the first exposure. The majority of those retested had lower temperatures and symptoms were generally less pronounced than in control subjects receiving their first inhalation of virus.

Serological Response — Prior to the original spraying of the group the titers of antibody to influenza virus, Type B, were preponderantly low. In consequence of that experience, much higher levels were reached and, to a great extent, maintained through the interval of 3½ months between the termination of the first study period and the beginning of the second. Moderate shifts occurred, however. In 8 instances the titers decreased within a range which might be anticipated with the lapse of time. Increases which were noted in 12 instances are probably attributable to continued accessions of antibody beyond the time at which the second sample was obtained rather than to deterioration of the earlier samples of serum during the period of storage. This was evidenced by comparing results of tests conducted in December with the first two specimens of serum

TABLE 4

Changes in Antibody Titer in Interval Between Studies

	Decreased			Increased		
Unchanged	2 x	4 x	8 x	2 x	4 x	8 x
6	3	4	1	4	5	3

and those in April which involved all four specimens.

Except for one value of 16,000 the titers of the group immediately before reinoculation ranged evenly from 128 to 2,048 with a mean of 848 and a median of 512. The titers of the con-

TABLE 5

Serological Responses to First and Second Inoculations of Influenza

Antibody Titer Before Inhalation	Sprayed—First Series				Resprayed				Sprayed Controls			
		Increase in Titer				Increase in Titer				Increase in Titer		
	No.	0	2 x	4 x +	No.	0	2 x	4 x +	No.	0	2 x	4 x +
64 or less	21	1	1	19	..	..	..	..	11	1	0	10
128–256	3	1	1	1	9	1	2	6	11	3	3	5
512–1,024	0	..	..	..	10	5	5	0	1	1	0	0
2,048+	0	..	..	..	5	3	0	2	.	..	..	..
Total	24	2	2	20	24	9	7	8	23	5	3	15

TABLE 6

Summary of Clinical and Serological Responses to First and Second Inoculations of Type B Influenza Virus

Subject	Original Dose	Severity of Symptoms		Maximal Temperature			Antibody Titers	
		1st	2nd	1st	2nd	Diff. 1-2	1st	2nd
9 th	U	+++	0	99.8	100.2	+0.4	<32/4,096	1,024/2,048
11 gb	2 x	+++	+++	103.2	102.6	−0.6	64/1,024	1,024/2,048
22 ak	10 x	+++	0	103.6	100.2	−3.4	<32/128	512/1,024
26 jp	10 x	+++	++	103.4	101.2	−2.2	<32/64	256/4,096
29 cs	10 x	+++	+++	103.4	103.8	+0.4	<32/256	128/1,024
14 lb	2 x	++	++	101.8	100.4	−1.4	<32/512	128/512
23 al	10 x	++	0	101.8	100.2	−1.6	64/4,096	1,024/2,048
25 wo	10 x	++	++	102.8	101.0	−1.8	<32/256	2,048/2,048
30 ws	10 x	++	+	98.6	100.6	+1.0	32/256	128/128
12 db	2 x	+	++	101.0	100.8	−0.2	64/128	128/512
16 ld	2 x	+	+	100.4	100.8	+0.4	<32/512	256/512
17 cd	2 x	+	0	98.6	99.6	.....	256/512	512/512
8 jg	U	+	+++	100.4	102.4	+2.0	<32/128	128/1,024
21 fj	10 x	+	+	103.4	100.0	−3.4	64/8,192	2,048/8,192
4 ec	U	0	0	100.4	100.6	+0.2	32/1,024	2,048/2,048
6 eb	U	0	0	100.0	100.4	+0.4	32/4,096	512/1,024
7 hf	U	0	0	100.4	100.6	+0.2	64/256	1,024/1,024
13 jb	2 x	0	+++	102.0	101.8	−0.2	64/64	128/256
15 tc	2 x	0	0	100.4	101.0	+0.6	64/512	512/256
1 rb	U	NH	+	102.0	100.4	−1.6	256/256	512/512
2 rb	U	NH	+++	102.6	101.2	−1.4	<32/64	128/512
19 jh	2 x	NH	NH	101.8	99.6	−2.2	<32/256	2,048/8,192
27 js	10 x	NH	NH	102.4	102.0	−0.2	128/512	16,000/16,000
28 vs	10 x	NH	NH	101.8	99.8	−2.0	64/1,024	1,024/1,024
3 wb	U	NH	....	100.6	.....	.....	<32/128	.....
5 tc	U	+	....	102.4	.....	.....	<32/1,024	.....
10 wh	U	0	....	101.8	.....	.....	<32/4,096	.....
18 bf	2 x	+++	....	103.4	.....	.....	128/1,024	.....
20 hh	2 x	+++	....	102.2	.....	.....	64/2,048	.....
24 cn	10 x	0	....	103.0	.....	.....	64/1,024	.....

Symptoms: 0 to +++ = increasing severity of constitutional reaction.
NH = no information from patient.

Antibody titers: Numerator = titer before inoculation.
Denominator = titer after inoculation.

U = inhalation of virus—unconcentrated.
2 x = inhalation of virus—concentrated twofold.
10 x = Inhalation of virus—concentrated tenfold.

trols who were to receive the spraying for the first time had a mean of 141 and a median of 128. The responses of the two groups are seen in Chart 1 and are tabulated (Tables 5, 6, 7).

TABLE 7

Responses Among Controls Sprayed in Immunity Test

Subject	Maximal Temperature	Symptoms	Antibody Response
C8 ck	104.0	+++	<32/1,024
C36 cg	103.4	+++	128/1,024
C32 wh	103.0	+++	<32/1,024
C42 wo	103.0	0	16/16
C19 ct	102.8	+	64/256
C41 hm	102.6	+++	<32/256
C23 jw	102.6	0	256/8,192
C43 ns	102.4	+++	<32/512
C37 jh	102.4	0	32/128
C35 jc	102.2	0	64/8,192
C21 db	102.0	+++	64/256
C38 lh	102.0	+++	256/256
C14 js	102.0	+++	128/256
C40 jm	102.0	+	128/256
C6 bg	101.8	–	256/2,048
C11 sn	101.2	++	128/1,024
C5 jf	101.2	0	256/256
C13 pt	101.0	++	64/256
C15 is	101.0	0	256/512
C9 dMc	100.8	++	256/256
C33 ce	100.6	0	256/2,048
C34 ed	100.2	0	64/512
C39 jk	100.0	0	512/512

Symptoms: 0 to +++ = increasing severity of constitutional reaction

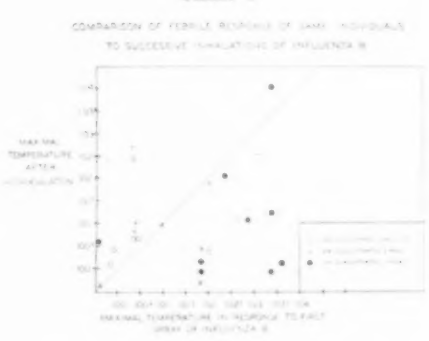
Antibody titers: Numerator = titer before inoculation
Denominator = titer after inoculation.

Following the inhalation of virus, 8 of the experienced and 15 of the new subjects developed significant increases in titer. The increment of increase, however, was much greater in the controls whose mean titer rose from 141 to 1,260 (median 512) while the rise in resprayed individuals was from a mean titer of 848 to one of 1,776 (median 1,024). Significant serological responses in both groups were most common in those with the lower antibody levels and least frequent in subjects with high titers.

COMPARISON OF RESPONSE OF SAME INDIVIDUALS TO FIRST AND SECOND EXPOSURES

Fever—Of the 24 individuals who received the two inhalations of virus, 21 developed fever of 100° or more each time; only 1 remained below that point in both tests. In 10 instances the maximal temperature following the second exposure was within 0.5° F. of the height reached in the primary attack; the majority of these individuals were those who, following the smaller amounts of virus, had the milder fevers originally (Chart 4). One of them, however, with fever of 103.4° in the primary episode responded with 103.8° to the second inoculation (Chart 5). On the other hand, of the 14 cases who exhibited fever higher than 101° on the first exposure, 10 showed decidedly lower temperatures, with a mean decline of 1.5° F., in the second test (Chart 6). In only 3 instances was the second fever significantly higher than the first (Chart 3, Table 6).

CHART 3



Two interpretations are suggested by the results. The fact that primarily those with the highest original fevers exhibited reduced temperatures following reinoculation (Chart 4) might be considered to indicate that they alone had profited from the earlier experience and that the reactive state of the remaining individuals had been essentially unaltered. Since, however, most of the subjects with fever of about the same extent in both tests were those who received the smaller doses of virus the first time, it may be inferred that the milder response to the first inhalation of virus had been just as beneficial in

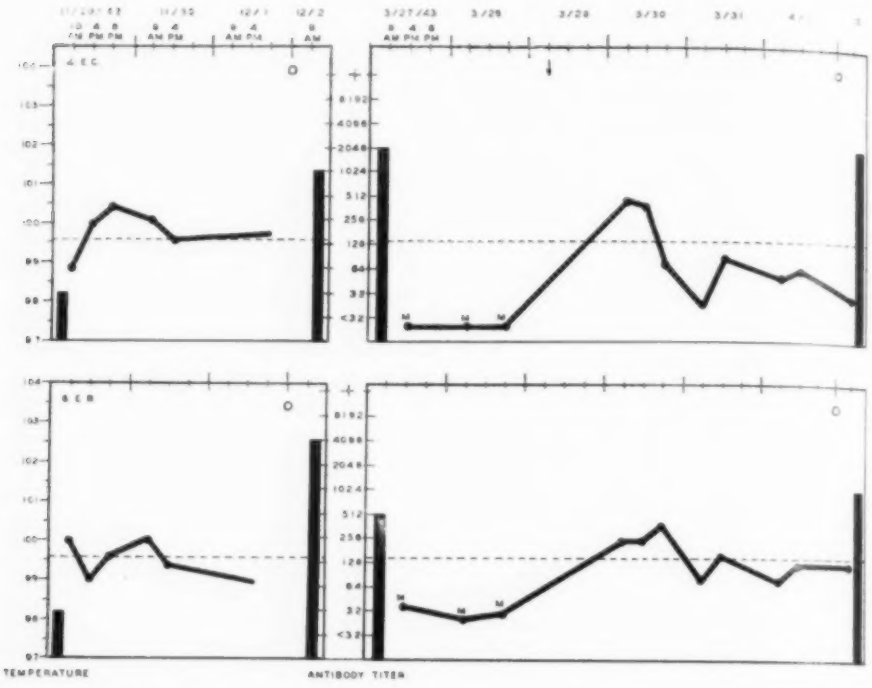


CHART 4—Subjects 4 and 6 received unconcentrated virus in November. Temperature was low, no symptoms were noted but sharp rises in antibody occurred. Four months later virus concentrated tenfold was administered. The second clinical response was similar to the first but no further increase in antibodies took place.

The left half of each chart represents the original febrile response beginning the day after inoculation; the right half the response to reinoculation. The vertical columns indicate antibody titers immediately before and 2 weeks after inoculation. Symbols in upper right corners indicate severity of symptoms. (See Table 6). *M* signifies oral temperatures.

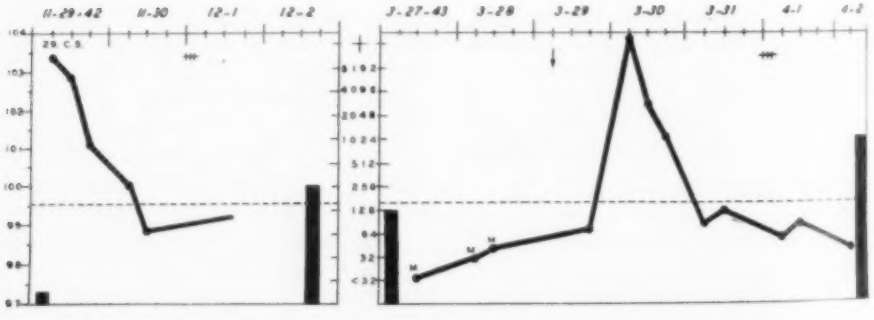


CHART 5—Illness was among the most marked of the group after each exposure to virus concentrated tenfold. Significant antibody increases occurred both times (Subject 29).

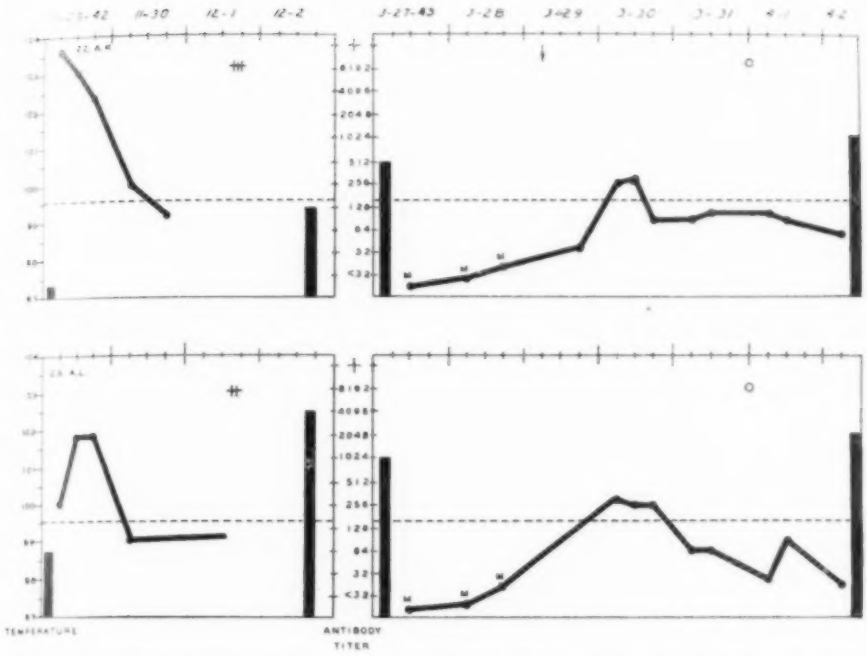


CHART 6—The charts of subjects 22 and 23, who had sharp febrile reactions, pronounced symptoms, and significant antibody responses to the first inhalation of virus on November 28, 1942. Second inoculation on March 29, 1943, was followed by markedly reduced temperatures and symptomatology.

limiting the second response of these individuals as was the more severe reaction in reducing the height of fever in the other group. Had this not been the case higher temperatures, equivalent to those of the controls, might have occurred (Chart 3).

Symptoms—Although the symptomatic evidence is of limited value, definite complaints were obtained from 14 of the group after the first spray and from 13 of them following the second. A comparison of the complaints of the same individuals in the two experiences revealed the following:

No symptoms either test	4
Decreased severity in second test	6
Increased severity in second test	5
Same severity both tests	6
No information either test	3

In both periods symptoms tended to be most severe among those with the highest fevers. In the individuals exhibiting the more marked symptoms after the second exposure, however, only 1 showed higher fever than in the original test. Diminished febrile reactions to the second spray, therefore, were not consistently accompanied by a reduction in symptoms, nor was the reaction to reinoculation clearly referable to the severity of initial response. The more marked symptoms in the second test followed just as commonly after a severe as after a mild primary response (Table 6).

Serology—The individuals subjected to reinoculation had considerably higher titers of antibody at that time than were observed at the time of their original inoculation. In general, they were less responsive, serologically, to

the second inhalation than to the first. The mean titers before and after the first exposure were 65 and 1,180; before and after the second, 848 and 1,776. Whereas, originally 20 of the 24 had antibody rises to four times or more the initial titer, and 2, twofold; after the second spray 7 showed twofold increases and only 8 had a fourfold or greater increase (Tables 5 and 6, Chart 1). Although these 8 individuals had exhibited significant responses to the first inoculation, the medians of their titers preceding and following the first infection were low, 16 and 96, respectively. At the time of the immunity test, 5 of them had titers of 128; the lowest level encountered in the retested series. It is well to emphasize that they belonged to the group with most definite symptoms and fever in each test. Despite the sharp rise in antibodies from the original level these subjects were again clearly susceptible to reinoculation with serological and clinical responses to second inoculation in many respects parallel to the first.

Briefly, inhalation of Type B influenza virus 4 months after exposure to the same virus induced again febrile response in the majority of the group. In general, temperatures were either lower or about the same level as those exhibited in the first attack. When symptoms could be obtained there was no relation demonstrable between their severity in the first instance and the response to the second attack (Chart 7).

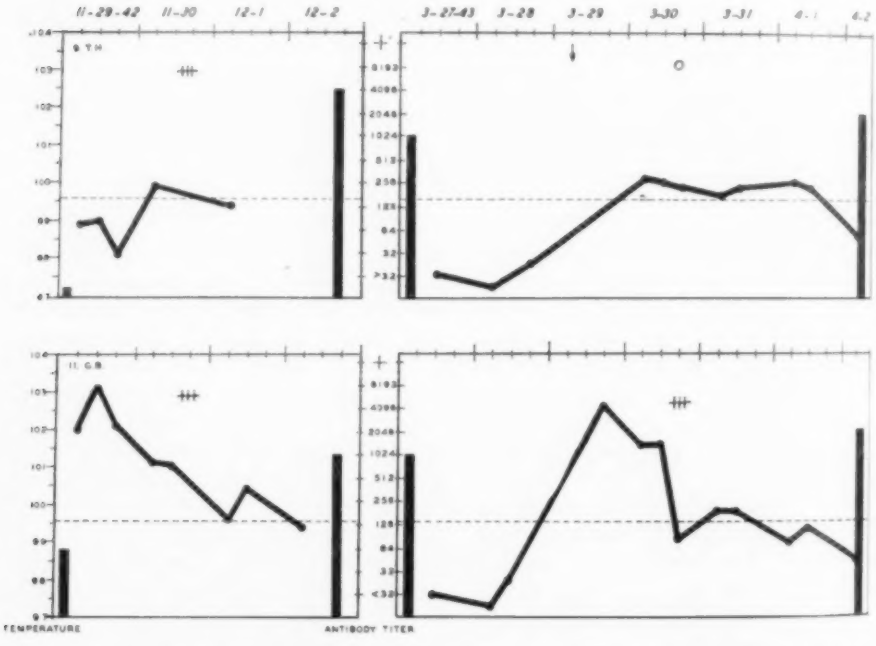


CHART 7—*Subject 9.* Illustrates the presence of pronounced symptoms and sharp antibody response with minimal febrile reaction following inhalation of unconcentrated virus. Test for immunity with concentrated virus elicited no symptoms, slight fever and no further rise in antibody.

Subject 11. Despite well marked fever, symptoms and antibody response to the first inoculation, the severity of the second clinical reaction was undiminished. The antibody titer was not significantly affected.

Although antibody titers were decidedly higher at the time of reëxposure than originally, one-third of the subjects, comprising largely those with the most severe second illness, responded with significant serological reactions again. The major effect of previous infection appeared, therefore, to be a reduction in severity of the second attack.

PERSISTENCE OF VIRUS

No virus was recovered from the throat washings obtained from 29 sprayed subjects 24 hours after inhalation of the virus. Each specimen was tested in mice with the appearance of pulmonary lesions taken to indicate infection. With five specimens attempts were made to adsorb virus from the washings with chicken erythrocytes and concentrate it by elution. No significant agglutination of red cells by the eluate was noted. The failure to find virus under these conditions was somewhat surprising in view of the short period elapsing after the spray.

On the other hand, that virus was in the air was demonstrated by the infection of mice exposed during the spraying procedure. The 5 mice which were given a stimulating intranasal inoculation of broth following exposure in the spray room, died of influenza virus infection; 2 of the remaining 5 died and the other had extensive pulmonary lesions when autopsied on the 10th day. All the mice exposed in the large day room occupied by the patients survived for the 10 day period of observation but had extensive pulmonary lesions. Influenza virus, Type B, was identified. These results show that the virus was distributed in the atmosphere by the spray itself and probably for a limited period, at least, by the infected subjects. It is of interest, however, that in this second series only 2 of the 18 contact controls gave serological evidence of having been infected through the environment in contrast to 11 instances in the first contact group.

RELATION OF CLINICAL RESPONSE TO SEROLOGICAL STATUS

In the first experiment, the use of three different strengths of virus apparently accounted for certain variations in clinical response. Partly because of these conditions, no intimate relation between symptoms or fever and the initial or subsequent antibody titer was evident. For the second spraying, virus concentrated tenfold was used throughout and the influence of other factors can be considered on the basis of uniform dosage.

In Chart 2 and Table 8 it is seen that when compared with themselves in the first test or with the controls for the second test, individuals undergoing their second experience had in general the higher antibody titers and lower temperatures. Moreover, the controls with lowest antibody titers presented a preponderance of high temperatures. In the intermediate range of titers (128–256) both controls and reinoculated subjects were found. The temperatures of individuals in this antibody zone were more widely distributed than those in the higher or lower antibody levels. But because of the limited numbers and since practically all the titers above 256 belong to individuals previously inoculated while the low titers of 64 or less are limited to those who had not undergone recent infection, no strict conclusion can be drawn. Nevertheless, a comparison of the responses of the resprayed and the controls of the second series does suggest a trend of decreasing severity of fever as antibody levels rise. Only 4 of the 24 reëxposed subjects had temperatures of 102° or more, while 14 of the 23 controls reached that level. Totalling all groups it is seen that temperatures of 101° or more occurred in 22 of the 32 (68.7 per cent) with titers of 64 or less, in 16 of 23 (69.5 per cent)

TABLE 8

Relation of Febrile Response to Influenza B and Antibody Titer

Antibody Titer Prior to Inoculation	Maximal Temperature: Sprayed—1st				Respayed				Sprayed Controls—2nd				Totals			
	<100	100–100.9	101–101.9	102+	<100	100–100.9	101–101.9	102+	<100	100–100.9	101–101.9	102+	<100	100–100.9	101–101.9	102+
<32	2	2	2	5	..	..	..	..	..	..	0	5	2	2	3	10
32–64	..	5	2	3	..	..	..	..	..	1	1	4	0	6	3	7
128–256	1	..	0	2	..	4	3	2	..	2	4	5	1	6	7	9
512–1,024	..	..	..	..	2	6	1	1	..	1	..	..	2	7	1	1
2,048+	..	..	..	..	1	2	1	1	..	..	..	..	1	2	1	1
Totals	3	7	4	10	3	12	5	4	0	4	5	14	6	23	14	27

with titers of 128 and 256, in 4 of 16 (25 per cent) with titers of 512 or more.

The tendency for symptoms to be proportionate to fever was noted in both periods of observation of the original group and in the sprayed controls. At the time of the respraying, 9 of the 13 reinoculated subjects who presented positive signs or symptoms resided in the antibody levels of 128 or 256, the lowest of the group. This suggests again an association between antibody titers and severity of disease.

The 9 reinoculated individuals (2, 8, 11, 12, 13, 14, 25, 26, 29) with most definite symptoms (++ or +++) included 7 of the 9 with fever of 101° or greater, 7 of the 9 with lowest antibody titers (128 or 256), and among this 7 were 6 of the 8 who showed a fourfold or greater rise in antibodies following the second inoculation. In these instances, involving individuals with the lowest titers of the group, fever, symptoms, and antibody response combined to give the most complete evidence of infection (Chart 5). Of the 8 reinoculated subjects without complaints only 1 had fever as high as 101°, their antibody titers were all 512 or greater, and none showed a significant increase in antibodies. The suggestion arises that under the conditions of the present experiment significant rises in antibody are most common in those with the most definite clinical signs of disease. On the other hand, the absence of a fourfold increase in antibodies cannot be interpreted as freedom from infection when fever occurs in the presence of high antibody titers since they are less readily affected by additional antigenic stimuli (Chart 7, subject 11).

Among the sprayed controls a broad relation was also found between height of fever and the extent of antibody response. Of 10 with temperatures greater than 102°, all but 1 showed a fourfold or higher rise in antibody and 6 had more than an eightfold increase; of 13 with 102° or less only 6 had an increase of fourfold or more and none had more than eightfold increase. It should be recalled, however, that no such correlation was found in the original group receiving the different doses of virus.

In summary, the relation between the height of circulating antibodies and clinical response to infection is not clearly demonstrable in the limited data available from the present study. There exists a tendency, most evident in the previously infected, for high antibody titers to be associated with the lower temperatures. Among the controls sprayed in the second experiment there was also a tendency toward an inverse relation between the severity of reaction and the level of circulating antibody. On the other hand, all degrees of reaction were found at any given antibody level.

The results among the reinoculated individuals and their controls at the time suggest that the most prominent serological responses to infection occur in subjects with the most marked clinical reaction, although this was not noted among the individuals sprayed with different doses of virus in the first experiment. The fact remains that despite a rather uniform increase in antibody to levels beyond those encountered in the group originally, reinoculation 4 months later caused clinical evidence of infection in a high proportion of the 24 subjects a second time and in 8 individuals a second significant increase in antibody titer took place.

SPECIFICITY OF FEBRILE REACTIONS

Since the great majority of subjects in all three sprayed series, irrespective of dose or experience, had fever of 100° or more, it is apparent that if the lower fevers represent disease, infection 4 months earlier did not prevent reinfection. Although the serological responses and the presence of symptoms in afebrile subjects indicate that the mild fevers were associated with infection, the possibility that certain of the lower temperatures in the reinoculated group might be nonspecific remained. In order to study the question a series of individuals were sprayed with virus inactivated by ultra-violet irradiation.

Concentrated virus of the same lot as that used in the second test was irradiated with ultra-violet light for sufficient time to inactivate the virus as measured by loss of infectivity for mice and chick embryos. Eight subjects not previously studied and 4 who had been sprayed with active virus 4 months earlier were then given inhalations of the inactive virus for 5 minutes. Temperatures were taken before and after spraying and serological tests were made with serum obtained before and 2 weeks after the inhalation. One of the previously untreated subjects developed chilly sensations and a temperature of 102° the following day but an antibody titer of 32 remained unchanged. It seems likely that this represented an incidental illness. One of the 4 individuals sprayed earlier with active virus had a temperature of 100.4° on the 3rd day after spraying. The tardiness of this fever in comparison with the rapidity with which fever follows active virus indicates that it was not of the same nature. No other reactions were observed. None of the individuals showed a fourfold rise of antibodies as a result of spraying with inactivated virus.

The evidence clearly indicates that the elevated temperatures observed in the studies with active virus are not related to nonspecific factors associated with the spraying and that allergic reactions to egg fluid or the virus played no rôle in the symptomatic or febrile responses to the inhalation of active virus. Subsequent studies have added ample confirmation of this conclusion.

DISCUSSION

The inhalation of nebulized influenza virus, Type B, by human subjects produced an illness closely resembling that seen in the milder outbreaks of the natural disease. The course of the disease was brief and the severity varied among individuals, depending to some extent upon the concentration of virus administered. It is noteworthy that in most instances the incubation period was 12 to 24 hours, that temperatures greater than 102° F. were common, and that respiratory signs and symptoms were conspicuously infrequent while constitutional symptoms were predominant. No complications ensued.

Four months after the induction of clinical influenza, reëxposure of the same group of individuals to the same virus was again followed by clinical disease evidenced in fever, symptoms, and

serological reactions. Nine of them had temperatures of 101° or greater and 8 exhibited a second significant rise in antibodies. That a state of increased resistance had persisted over this period was seen, however, by the reduced severity of the second response in comparison with the primary reactions of the same subjects or controls. In estimating the degree of resistance, the significance of the febrile reactions among the reinoculated individuals must be appraised. The milder febrile reactions in the original group were largely limited to those receiving the smaller concentrations of virus. In the second instance, where one preparation of virus was used throughout, they were essentially exhibited by the reinoculated subjects in contrast to the inoculated controls. The infrequent and irrelevant fevers in untreated controls and in those sprayed with inactive virus strongly suggest that the temperatures of 100° to 100.9° in the reinoculated subjects represent, in the main, reactions to the inhalation of active virus rather than allergic or nonspecific responses to the sprayed material. This is further supported by the presence, as in subjects 12, 14, and 21, of symptoms and further increases in antibody titer comparable to those of individuals with higher fevers. Hence, it must be concluded that few of the previously infected subjects were wholly refractory to reinfection. On the other hand, the fact that 15 of the 24 reinoculated had temperatures below 101° while 19 of the 23 controls had temperatures of 101° or more indicates that the earlier infection had conferred a significant degree of resistance upon a majority of the individuals involved. Had the infection been milder the effect would probably have been enhanced, but this would require the employment of much larger numbers of individuals than seems feasible at the present time.

Information as to the influence of circulating antibodies upon the response to infection is not readily drawn from the present data. Combining the results from all groups it was found that 69 per cent of those with titers below 512, and 16 per cent of those with titers of 512 or more developed temperatures of 101° or higher. However, the low titers of antibody were preponderant among those receiving their first inoculation while those who had been previously infected possessed uniformly the higher titers. The recently experienced subjects with high titers had, in general, lesser febrile reactions than the inexperienced with low titers. On the other hand, the persistence of an increased titer of circulating antibodies from the first infection did not necessarily prevent the development of clinical disease a second time. Thus, although resistance and circulating antibodies were enhanced by infection, the evidence does not permit any conclusion as to a causal relationship. As has been shown elsewhere, an increase in circulating antibodies following infection [5] or vaccination [6] results in an increased neutralizing capacity of the nasal secretions. In these terms, circulating antibodies serve more as an index of the activity of the local protective mechanisms than representing the actual agency of resistance. This concept would appear clearly applicable under the conditions of the present study.

It may be objected that the procedures adopted constitute too severe a test of the immune state and that the respiratory tract is much more intensely exposed to the virus than is the case in natural infection. This implies that under natural conditions a minute amount of virus enters the upper respiratory tract during a brief period of exposure. On the other hand, recent studies of air-borne infection call attention to the fact that, in closed spaces, contamination of the air by infected individuals constitutes an opportunity

for prolonged exposure and permeation of the respiratory tract with much larger amounts of virus than mere contact would afford. The serological evidence among 11 of 30 contact controls in the first experiment demonstrates that the virus employed in the present investigation also produced infection after entering the respiratory tract by the more physiological method of normal respiration in an infected atmosphere. Although approximately 0.5 ml. of the virus was delivered to each individual the actual amount retained is not known because much of it was promptly exhaled. Moreover, the differences in response among the groups receiving different concentrations of virus suggests that the amount was not greatly in excess of that needed for adequate clinical reaction. The frequency of infection was clearly heightened by the manner of observation, detecting brief and mild responses which under conditions of normal activity would not have been noted. The incidence of clinical disease in an epidemic is related to the care with which a population is observed and the infectiousness of the prevalent strain. The fact that the incidence of influenza, Type B, has been low in recent epidemics may well reflect a need for relatively large doses of the current strains in order to produce the disease naturally as well as experimentally. For the purposes of this investigation it has been advantageous to employ amounts of virus sufficient to compensate for natural defects in the strain and yet to permit a demonstration of the differences in response of individual subjects. Under other conditions the same procedures have clearly demonstrated firm immunity in groups under investigation.

Bull and Burnet [7] have recently reported observations concerning the immune response of human subjects to small intranasal doses of an attenuated form of the same strain of influenza virus, Type B, as was used in these studies. It is of interest to point out certain differences in effect and interpretation. Their subjects were selected because of low antibody titers, and the presence of immunity was, to a large extent, determined by failure to show a rise in antibodies to the second inoculation. The demonstration of virus in nasal secretions was also involved. The symptoms were extremely mild and mostly nasal; fever is not recorded. Certain of the rises in antibody to which they ascribe importance, seem of doubtful significance; an increase in antibody after reinoculation may not occur even with sharp clinical response. The predominance of nasal symptomatology in their cases as evidence of response is in contrast to its relative infrequency in the clinical disease. The absence of controls for the immunity test and for the nasal symptoms furnishes little basis for evaluating the results. Certainly, there is no evidence in our studies that subjects with highest antibodies respond with most marked symptoms; quite the contrary. Moreover, if frank infection fails to give uniform staunch resistance over a period of 4 months, it seems unlikely that single exposure to a much milder single stimulus by the same route will have a greater effect. Bull and Burnet have measured essentially the serological reactions to a mild application of attenuated virus and it seems doubtful that further inference of its effect upon resistance to clinical infection can be drawn at present.

From the studies here reported the suggestion is derived that if procedures devised for prophylaxis against influenza are to be effective they should be repeated at intervals shorter than 4 months. The evidence shows that the degree of resistance persisting 4 months after infection is less influenced by the severity of the original infection than by the responsiveness and con-

tinued activity of the individual's immune mechanisms, suggesting that selection may be made of those most in need of the additional stimuli.

SUMMARY

Inhalation of finely dispersed Type B influenza virus by human subjects resulted in a high incidence of clinical infection resembling a mild form of the natural disease.

Four months later 24 of the same subjects received a second inhalation of the same virus. Fever, symptoms and serological responses were noted a second time. The illness was milder in the majority of previously infected individuals than in controls inoculated at the same time. Few were refractory to reinoculation.

The diminished response to reinfection was most evident in those who had the highest fevers in the first test. Nevertheless, the evidence indicates that mild primary infections were as beneficial as the more severe ones.

Although there was a trend toward association between high antibody titers and low temperatures, no uniform correlation between the antibody titer of an individual and his response to inoculation was found.

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Epidemiology of Atypical Pneumonia and Acute Respiratory Disease at Fort Bragg, North Carolina*

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DURING the past decade atypical pneumonia has been recognized with increasing frequency both in the armed forces and in civilian groups.[1–4] The disease is a clinical syndrome which is similar in onset and symptomatology to moderately severe acute respiratory diseases, such as nasopharyngitis, bronchitis and grippe. The characteristic feature of the disease is the finding of a pulmonary lesion on roentgenographic examination in the absence of rigor, pleuritic pain, rusty sputum, and other signs which are usually associated with acute bacterial pneumonia. In fact, extensive radiographic shadows may be present without being evident by physical examination of the patient. Therefore, the frequency with which this syndrome is diagnosed depends upon the number and frequency with which routine roentgenograms of the chest are taken on patients with acute respiratory illnesses.

The incidence of the disease in the Army is high in relation to other forms of pneumonia. In certain Army camps where routine radiographic studies were made on all respiratory admissions and where careful bacteriological studies were done, it was found that from 85 to 90 per cent of all cases of pneumonia were of the atypical variety.[5, 6]

The etiology of the disease is unknown. Although a number of agents, viruses, rickettsiae, fungi, and bacteria have been shown to produce similar clinical syndromes,[7, 8] these agents have been thoroughly excluded as possible causes in the great majority of cases.[5, 6] Since there is a close clinical similarity between atypical pneumonia and common respiratory disease, the epidemiological studies in the present paper include a consideration of both diseases. Special emphasis has been placed upon studies of the incidence of respiratory diseases among seasoned men and new recruits, and upon the epidemiological relationship between atypical pneumonia and other acute respiratory infections. A brief description of an epidemic of German measles will also be presented for the purpose of contrast to the other findings.

The period of this study extends from October 31, 1942, to May 28, 1943. During this interval, the reported admission rates for common respiratory disease were similar to comparable rates for all troops in the Fourth Service Command and for the Army in the Continental United States. Moderate numbers of cases of meningococcal meningitis, streptococcal pharyngitis, and pneumococcal pneumonia occurred; but the total of all cases of known etiology was small in comparison with the total incidence of respiratory dis-

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TABLE 1

Incidence Rates for Respiratory Admissions and Atypical Pneumonia per 1,000 per Week, FA RTC and Other Organizations Stationed at Fort Bragg, N. C. October 31, 1942, to May 28, 1943

Week Ending	FA RTC		Other Organizations	
	Respiratory Admissions	Atypical Pneumonia	Respiratory Admissions	Atypical Pneumonia
Nov. 6	5.4	1.0	1.3	0.31
13	6.2	1.0	2.5	0.35
20	10.2	1.5	2.6	0.35
27	9.4	1.3	2.6	0.34
Dec. 4	13.1	1.2	3.8	0.47
11	16.9	2.6	3.8	0.48
18	22.2	2.4	3.9	0.64
25	29.6	2.1	6.2	0.54
Jan. 1	36.3	3.5	6.2	0.69
8	25.8	4.0	7.1	0.98
15	19.3	2.1	8.4	0.76
22	13.9	1.9	6.3	0.46
29	10.2	0.67	5.1	0.44
Feb. 5	11.1	1.4	4.4	0.34
12	13.7	1.9	3.5	0.39
19	14.8	1.6	2.9	0.30
26	24.0	2.1	4.3	0.40
Mar. 5	24.5	1.9	2.7	0.22
12	28.3	1.8	2.9	0.22
19	26.2	1.9	3.5	0.36
26	21.6	1.2	2.5	0.32
Apr. 2	14.4	1.6	2.6	0.22
9	13.0	0.94	2.3	0.11
16	10.4	0.71	2.7	0.18
23	13.2	0.95	2.7	0.11
30	11.0	0.96	2.9	0.28
May 7	11.2	0.98	2.4	0.10
14	11.2	1.5	2.3	0.10
21	9.5	0.80	1.8	0.13
28	8.0	0.86	1.3	0.07

Officers excluded
Civilians excluded
Atypical pneumonia with onset in hospital excluded

ease. The great majority of the cases were undifferentiated respiratory infections of unknown etiology.

METHODS

The data on atypical pneumonia and German measles have been obtained by abstracting the records of the Registrar's Office, Station Hospital, Fort Bragg. The final diagnoses of the hospital staff on disposition of the cases have been accepted. Throughout the period of this study, the medical staff was searching for cases of atypical pneumonia. Frequent roentgenograms were taken on cases of respiratory disease in which this syndrome was suspected. The data on incidence of acute respiratory diseases have been obtained by tabulating the daily numbers of admissions to the respiratory wards of the hospital. The diagnoses in these cases are based upon the impression of the medical officers in the admitting office. A separation of these respiratory admissions into diagnostic groups has not been attempted.

Fort Bragg is a large army post situated in southeastern North Carolina. Among the various organizations stationed there, the one which has been studied in greatest detail is the Field Artillery Replacement Training Center (FA RTC). This organization is a school which gives basic training to new recruits. The trainees come directly from reception centers in all parts of the

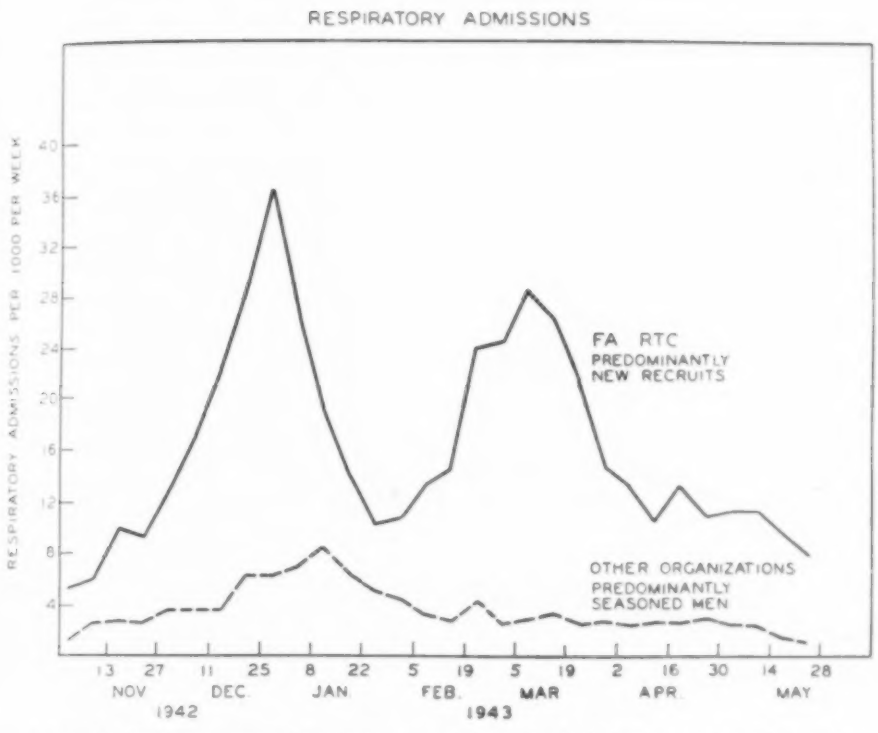

FIGURE 1—Incidence rates of respiratory admissions per 1,000 per week, FA RTC and other organizations stationed at Fort Bragg, N. C., October 31, 1942, to May 28, 1943.

United States. The largest proportion, however, come from the northeastern states. With few exceptions, the men have had less than 1 month of military experience prior to their arrival, and the majority of them have been in the Army less than 10 days. At the time of their arrival, most of the recruits are grouped into battalions of approximately 1,000 men each, and are further subdivided into four batteries of 250 men each.

During the period of the present study, two separate courses of basic training were given in different battalions. One course, designed for limited service men, lasted 8 weeks. The other, designed for field artillery trainees, was of 13 weeks' duration. After completion of training, the men were transferred to other stations. Thus, there was an intermittent flow of large groups of new recruits through this center.

The other organizations on the post were tactical and service units which were composed largely of seasoned men with 3 to 6 months or more of military experience. Some of these organizations received complements of new recruits from time to time, but the size of such additions was small in comparison with the total strength of the units.

All soldiers at Fort Bragg were housed in standard two-story barracks originally designed for 63 men. Crowding in the barracks occurred in some organizations but this rarely exceeded 80 men per barrack. In the FA RTC, only occasionally were more than 70 men housed together in one building.

INCIDENCE OF RESPIRATORY ADMISSIONS AMONG NEW RECRUITS AND SEASONED MEN

The weekly incidence rates of respiratory admissions from the FA RTC and from the other organizations stationed at Fort Bragg are shown in Table 1 and Figure 1. In the FA RTC, the incidence began to increase in November and rose sharply to a peak of 36 cases per 1,000 per week in the last week of December. The rates fell abruptly during January, but rose again in February and reached a somewhat lower but broader peak in March. There was a continuous downward trend in April and May. The two peaks in this curve developed immediately following the arrival of large groups of several thousand new recruits.

The incidence rates for the other organizations on the post were markedly and consistently lower than the rates for FA RTC. They increased slowly through November and December, and reached a peak of only 8.4 per 1,000 per week in the middle of January, after which there was a progressive downward trend. Throughout the winter, the incidence in the FA RTC was from two to ten times as high as that in the other organizations. As will be shown later, this difference is clearly the result of the high proportion of new recruits in the FA RTC.

Study of the incidence of respiratory

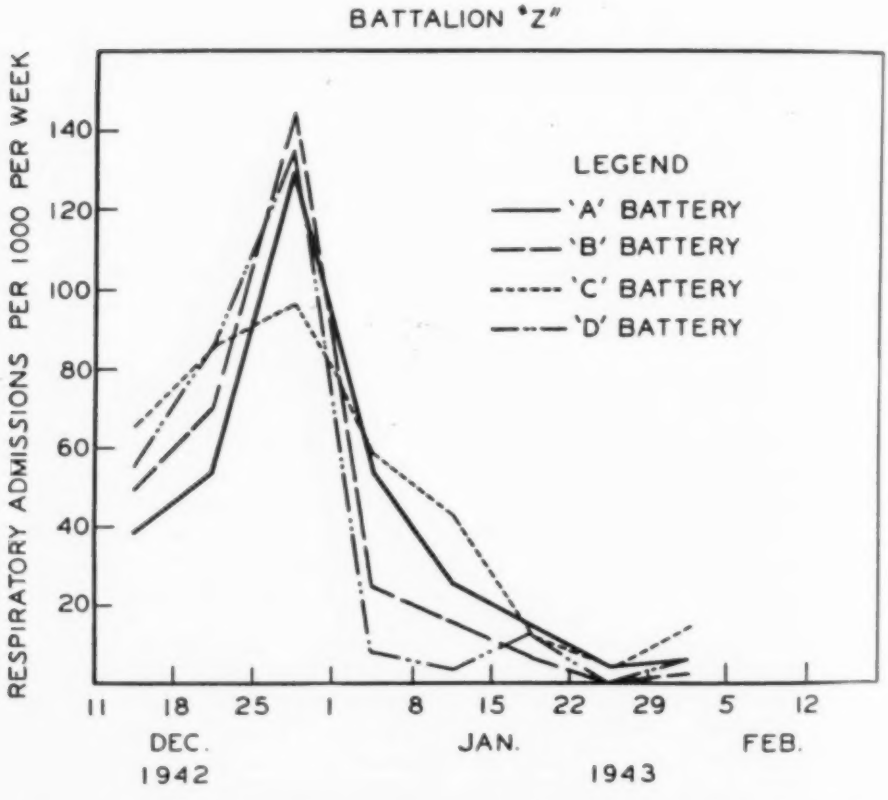

FIGURE 2—Respiratory admission rates per 1,000 per week, batteries of Battalion "Z," FA RTC, Fort Bragg, N. C., December 12, 1942, to February 5, 1943

TABLE 2

Respiratory Admission Rates per 1,000 per Week
Batteries of Battalion "Z" FA RTC, Fort Bragg, N. C.
December 12, 1942, to February 5, 1943

Week Ending		Battery A			Battery B			Battery C			Battery D		
		Strength	Cases	Rate	Strength	Cases	Rate	Strength	Cases	Rate	Strength	Cases	Rate
Dec.	19	256	9	38	239	12	50	239	16	67	231	13	56
	26	242	13	54	242	17	70	240	21	87	242	17	70
Jan.	1	242	32	132	242	35	145	239	23	96	242	33	136
	8	241	13	54	242	6	25	239	14	59	240	2	8
	15	241	6	25	242	4	17	239	10	42	238	1	4
	22	241	4	17	242	2	8	237	3	13	235	3	13
	29	240	1	4	241	0	0	235	1	4	233	0	0
Feb.	5	240	2	8	241	1	4	235	4	17	233	2	8
	Total	240	80	333*	241	77	320*	238	92	387*	237	71	300*

* Total rate for 8 week period

admissions in the battalions of the FA RTC revealed that the high rates occurred almost entirely during the first 4 weeks following the arrival of the trainees. A definite and rather characteristic epidemic of respiratory disease occurred in each battalion of new recruits which arrived between December 1 and April 10. The data on several of these battalions will be presented.

The incidence rates in the four batteries of "Z" battalion are shown in Table 2 and Figure 2. The men in this unit arrived between December 10 and 13. During the first week following arrival, the incidence rate was 50 per 1,000 per week. It increased moderately in the second week, and markedly in the third week, after which it fell abruptly. During the 8 week course of training, over 30 per cent of the entire group were admitted to the

TABLE 3

Respiratory Admission Rates per 1,000 per Week
Batteries of Battalion "Y" FA RTC, Fort Bragg, N. C.
December 26, 1942, to April 30, 1943

Week Ending		Battery A			Battery B			Battery C			Battery D		
		Strength	Cases	Rate	Strength	Cases	Rate	Strength	Cases	Rate	Strength	Cases	Rate
Jan.	1	...	..	..	158	2	13	150	10	67	152	7	46
	8	...	..	..	250	10	40	233	13	56	228	23	101
	15	...	..	..	239	22	92	243	24	99	235	19	81
	22	...	..	..	239	11	46	241	19	79	239	15	63
	29	...	..	..	239	6	25	238	5	21	240	10	42
Feb.	5	242	15	62	239	2	8	238	2	8	240	3	13
	12	242	41	169	239	1	4	238	1	4	240	1	4
	19	242	14	58	239	1	4	238	1	4	240	2	8
	26	242	9	37	239	2	8	238	1	4	240	4	17
Mar.	5	242	4	17	...	..	..	...	..	..	...	..	..
	12	238	4	17	242	15	62	208	12	58	100	8	80
	19	236	12	51	242	35	145	242	26	107	208	25	120
	26	236	2	8	242	25	103	242	23	95	229	22	96
Apr.	2	230	0	0	242	8	33	242	8	33	238	13	55
	9	...	..	..	235	3	13	232	13	56	214	4	19
	16	...	..	..	235	1	4	232	3	13	212	1	5
	23	...	..	..	235	1	4	232	2	9	212	2	9
	30	...	..	..	235	6	26	232	3	13	210	4	19

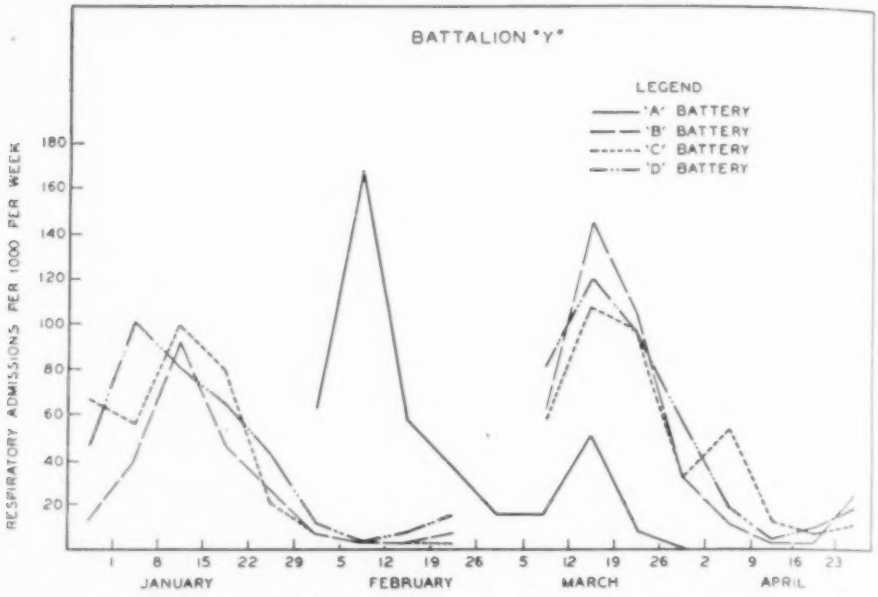

FIGURE 3—Respiratory admission rates per 1,000 per week, batteries of Battalion "Y," FA RTC, Fort Bragg, N. C., December 26, 1942, to April 30, 1943

hospital for respiratory disease, and 86 per cent of the cases occurred within the first 4 weeks.

In Table 3 and Figure 3, are presented the data on Battalion "Y" over a period of 4 months. In this battalion, three batteries of new recruits arrived during the week from December 26 to January 2. An epidemic of respiratory disease occurred during the following month. At the end of January, the fourth battery was filled with new recruits and a sharp increase in incidence occurred among them. The men in the first three batteries completed their training late in February and were transferred to other stations. New groups of recruits were assigned and an epidemic of respiratory disease occurred immediately following their arrival.

TABLE 4

Respiratory Admission Rates per 1,000 per Week, Battalion "X" FA RTC according to Length of Army Service Prior to Arrival at Fort Bragg—February 20 to April 16, 1943

Week Ending	Length of Army Service: Less than 30 Days — Strength	Cases	Rate	30 Days or More — Strength	Cases	Rate
Feb. 26	343	12	35	412	1	2.4
Mar. 5	509	11	22	420	1	2.4
12	530	25	47	421	1	2.4
19	530	36	68	421	1	2.4
26	530	15	28	421	1	2.4
Apr. 2	530	8	15	421	2	4.8
9	530	3	6	421	0	0
16	530	1	2	421	3	7.1
Total	504	111	220*	420	10	23.8*

* Total rate for 8 week period

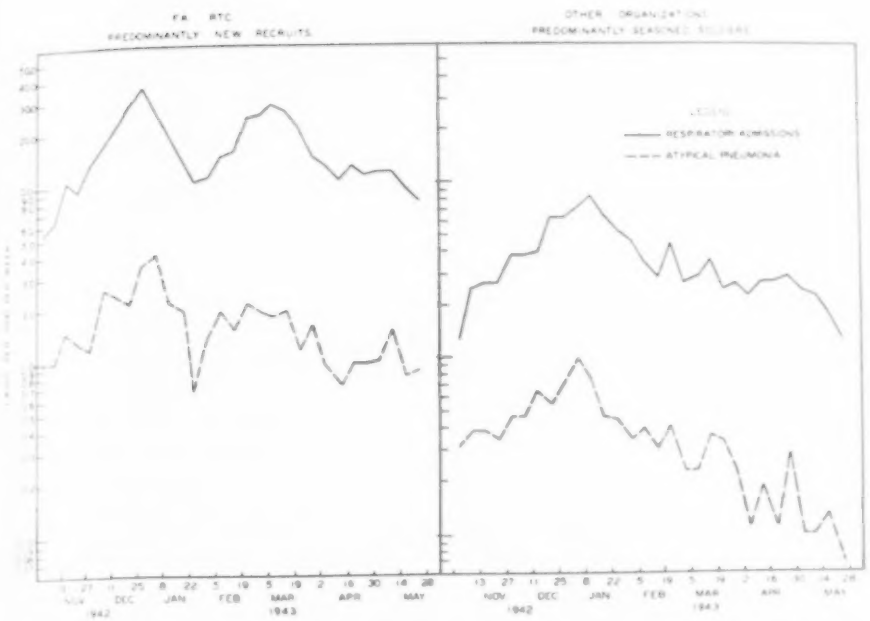

FIGURE 4—Incidence of respiratory admissions and atypical pneumonia per 1,000 per week, FA RTC and other organizations stationed at Fort Bragg, N. C., October 31, 1942, to May 28, 1943

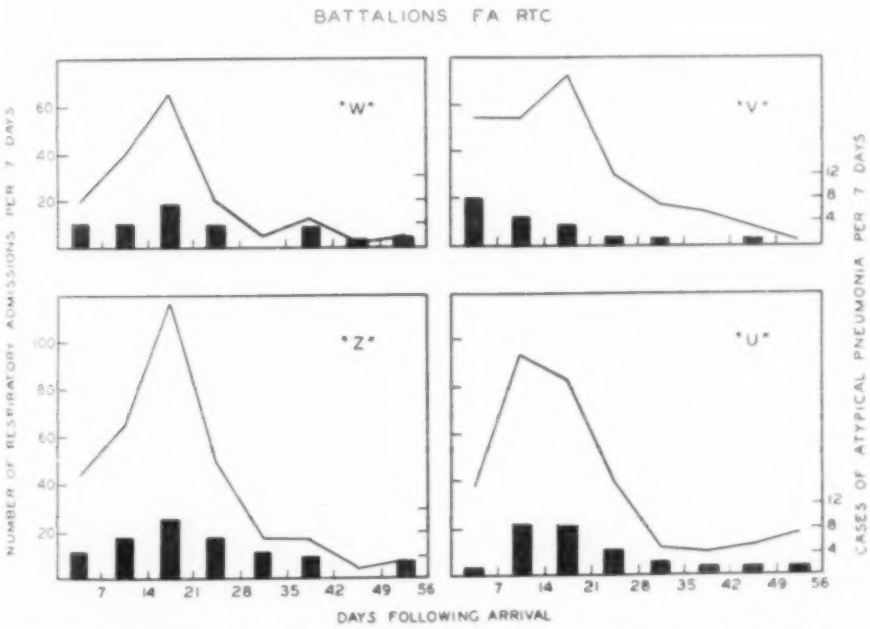

FIGURE 5—Incidence of respiratory admissions and atypical pneumonia, 4 representative battalions at FA RTC, Fort Bragg, N. C., December, 1942, to May, 1943

TABLE 5

Incidence of Respiratory Admissions and Atypical Pneumonia according to 7 Day Period Following Arrival, among Four Representative Battalions, FA RTC, Fort Bragg, N. C. December, 1942, to May, 1943

Days Following Arrival	Battalions							
	"W"		"Y"		"Z"		"U"	
	Respiratory Admissions	Atypical Pneumonia	Respiratory Admissions	Atypical Pneumonia	Respiratory Admissions	Atypical Pneumonia	Respiratory Admissions	Atypical Pneumonia
7	20	4	55	8	45	5	38	1
14	39	4	56	5	64	7	95	6
21	66	7	73	3	118	10	85	6
28	21	4	32	1	40	7	39	1
35	5	..	17	1	18	5	12	2
42	12	3	12	..	17	4	10	1
49	1	1	8	1	4	..	13	1
56	5	2	1	..	9	3	17	1

An unusual situation obtained in Battalion "X" (Table 4). Approximately half of the men in this battalion came directly from reception centers, as in the other battalions, but the other half of the men came from a camp where they had been resident for a period of from 6 weeks to 3 months. This group, therefore, was not under observation during the apparently critical first month of army life. The data for this battalion have been grouped according to the length of service of the men prior to arrival at Forth Bragg. The men who had been in the Army less than 1 month experienced moderately high admission rates for respiratory disease, while among those who had had more than 1 month of army service, the incidence of respiratory admissions was negligible.

RELATIONSHIP OF ATYPICAL PNEUMONIA TO RESPIRATORY ADMISSIONS

There was an apparently constant relationship between the incidence of respiratory admissions and atypical pneumonia both in the FA RTC and in the other organizations on the post (Table 1, Figure 4). Throughout the period studied there is a rough parallelism between the incidence curves of the two diseases. In spite of marked differences between the total respiratory admission rates in the FA RTC and the other organizations, the ratio of respiratory admissions to atypical pneumonia was approximately 10 to 1 in both groups.

This relationship was maintained within the battalions of the FA RTC. In Table 5 and Figure 5, data are shown for four battalions according to

TABLE 6

Incidence Rates of Respiratory Admissions and Atypical Pneumonia, 14 Battalions FA RTC according to 7 Day Periods Following Arrival, Fort Bragg, N. C. December, 1942, to May, 1943*

Days Following Arrival	Respiratory Admissions		Atypical Pneumonia	
	Number of Cases	Rate †	Number of Cases	Rate †
7	456	36.2	47	3.7
14	737	58.6	62	4.9
21	917	72.9	54	4.3
28	460	36.6	43	3.4
35	197	15.7	16	1.3
42	130	10.3	12	0.95
49	96	7.6	13	1.03
56	86	6.8	10	0.80

* Total strength of these 14 battalions was approximately 12,600 recruits
† Rates expressed as cases per 1,000 per week

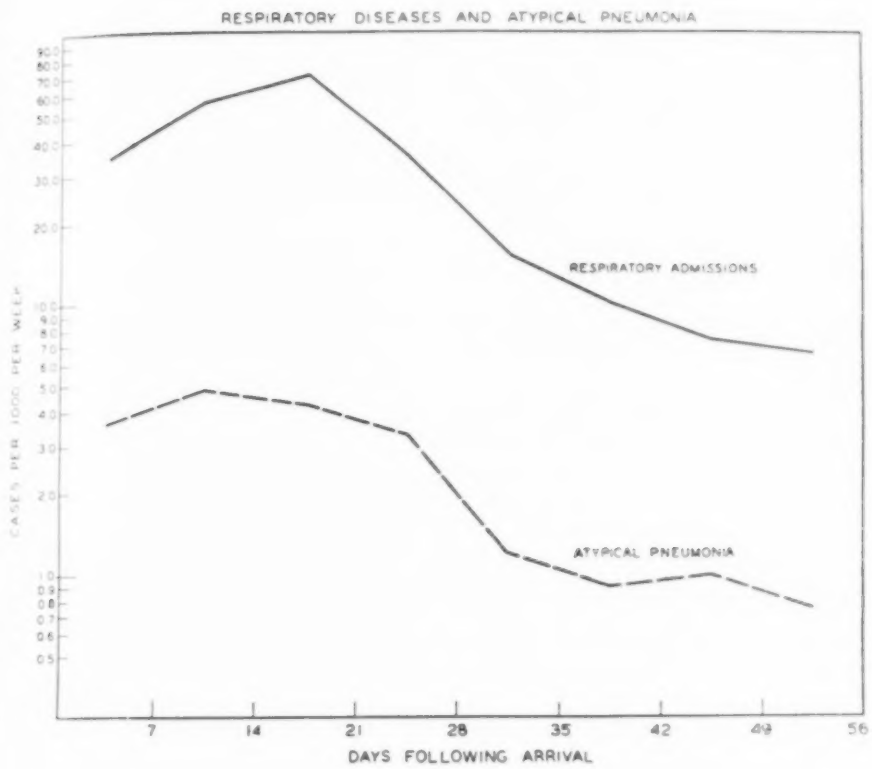

FIGURE 6—Incidence of respiratory admissions and atypical pneumonia among 14 battalions, FA RTC, according to 7 day periods following arrival at Fort Bragg, N. C., December, 1942, to May, 1943

7 day periods following arrival. These particular battalions have been selected from a group of 14 similar instances. They have been picked as representative examples to show the variations as well as the typical picture.

In 10 of the 14 groups, the peak incidence of atypical pneumonia coincided with that of respiratory admissions. Three examples, Battalions "U," "W," and "Z," are shown in Figure 5. In two of the remaining four battalions, the peak incidence of atypical pneumonia preceded that of the respiratory admissions as in Battalion "V"; and in two, the cases of atypical pneumonia were scattered without definite peaking.

Since the total number of cases of atypical pneumonia in each battalion was small, considerable chance variation might be expected. In order to reduce this variation resulting from small numbers, the data from 14 battalions have been consolidated according to time of arrival. The results are shown in Table 6 and Figure 6. The incidence, both respiratory disease and atypical pneumonia, was clearly concentrated during the first 4 weeks following the arrival of the men, after which the incidence was of the same order of magnitude as that among seasoned men.

CONTRAST BETWEEN GERMAN MEASLES AND RESPIRATORY ADMISSIONS

The occurrence of an epidemic of

German measles during the late winter and early spring of 1943 provided an opportunity for contrasting the distribution of a known specific infection with that of atypical pneumonia and respiratory disease. Scattered cases of German measles appeared in the FA RTC during January and February. The incidence rate increased rapidly and reached a peak of 6.7 per 1,000 per week in the week ending March 26. The rate dropped to 2.5 in the following week and progressively declined thereafter.

During the period of the German measles epidemic, 9 separate groups of new recruits were under observation. In 7 of these 9 groups, the peak incidence of German measles occurred during the week ending March 26. In one group, an equal number of cases occurred during the week ending March 19 and March 26, and in only one group did the highest incidence of this disease occur early in March.

In Figure 7, the time of occurrence of German measles is contrasted to that of the epidemic of respiratory disease in 5 representative battalions. The cases of German measles were clearly concentrated during the month of March. This concentration appeared

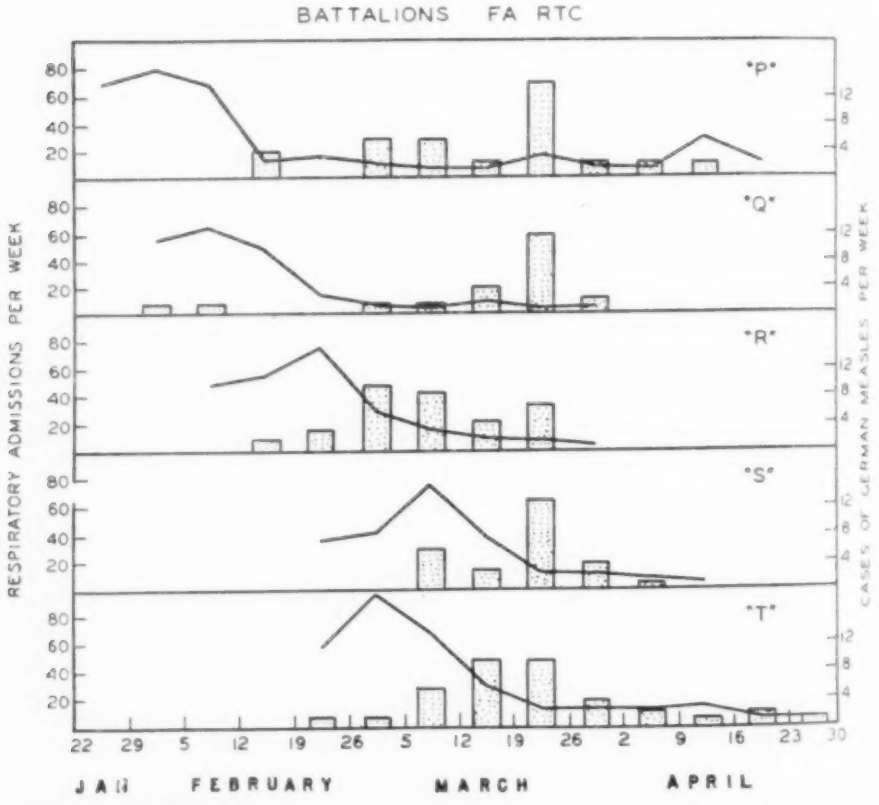

FIGURE 7—Incidence of respiratory admissions and German measles, 5 representative battalions, FA RTC, Fort Bragg, N. C., January 22 to April 30, 1943

to be unrelated to the time of arrival of the recruits. These findings stand in striking contrast to the epidemics of respiratory disease and atypical pneumonia, which occurred in each month from December to April and were directly related in every instance to the time of arrival of the men.

DISCUSSION AND SUMMARY

This study has served to emphasize the marked difference in incidence of respiratory disease between new recruits and seasoned soldiers. This phenomenon is well recognized in the Army.[9] Similar occurrences have also been described in certain civilian groups, particularly in schools.[10] The mechanism of this phenomenon cannot be explained adequately on the basis of present knowledge. Presumably, when large groups of individuals are brought together into a new environment, conditions become favorable for the development or spread of respiratory disease. In the absence of knowledge of the etiology of this group of diseases, it is impossible to determine whether the high incidence results from the interchange of numerous separate specific agents among individuals in close contact or whether the change in mode of living results, in some obscure fashion, in a breaking down of immunity or resistance to a common, single, specific agent.

It seems probable that both factors play a rôle in the phenomenon. It is recognized, for example, that certain diseases of known etiology, such as meningococcal meningitis and pneumococcal pneumonia, occur most frequently among new recruits.[9, 11] It is not clearly established, however, what part a preceding acute respiratory infection may play in the pathogenesis of these bacterial diseases. The one factor which is evident from the present studies is that during the past winter at Fort Bragg, the first 4 weeks of army life was a critical period, and that after the first 4 weeks, soldiers appeared to have an increased resistance to respiratory diseases.

The observations on atypical pneumonia indicate a close epidemiological association between this syndrome and common respiratory disease. Atypical pneumonia was continuously present at Fort Bragg throughout the period studied. The 10 to 1 ratio of respiratory admissions to cases of atypical pneumonia was maintained with reasonable constancy both among new recruits suffering a high incidence of respiratory disease and among seasoned men in whom the incidence was low. Taking this evidence in conjunction with the clinical similarity between the two diseases, the hypothesis is suggested that atypical pneumonia may be a severe manifestation of the same specific infection or infections which produce common respiratory illnesses. Reimann[12] and others[13, 14] have also advanced similar theories. Proof of such hypotheses, however, must rest upon demonstration of the etiological agent.

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Primary Atypical Pneumonia*

Commission on Acute Respiratory Diseases,† Fort Bragg, North Carolina

DURING recent years a rather characteristic syndrome in the group of respiratory diseases has been recognized with increasing frequency. This syndrome has been referred to by a variety of names, among them such terms as "atypical bronchopneumonia,"[1] "acute influenza pneumonitis,"[2] bronchopneumonia, variety X,[3] acute pneumonitis,[4-6] and disseminated focal pneumonia.[7] Loosely, and quite improperly in the light of our present knowledge, the infection has also been called "virus" pneumonia.[8]

Present evidence indicates that this syndrome has a diverse etiology. In the great majority of the cases, however, the cause cannot be demonstrated, but the illness is clinically similar to or indistinguishable from that due to known agents. The basis of discussion here will be those cases of unknown cause, officially designated by the Army as primary atypical pneumonia, etiology unknown.[9]

CLINICAL ASPECTS

The clinical characteristics of primary atypical pneumonia [8, 10-12] are those of an acute infection of gradual onset in which constitutional symptoms, such as headache, fever, malaise, and chilliness, predominate over respiratory symptoms in the early stages. A dry, irritating cough, sometimes paroxysmal in nature, develops soon after onset and may be accompanied by substernal discomfort, but rarely by true pleural pain. As the disease progresses, the cough becomes productive of mucus and of purulent or, occasionally, blood-streaked sputum. The typical bloody or "prune-juice" sputum of pneumococcal pneumonia does not occur. Coryza, sore throat, and gastrointestinal symptoms may be observed. The illness is ordinarily of mild or moderate severity and the patient does not appear as sick as his complaints would suggest. In a small proportion of the cases prostration, dyspnea, cyanosis, and circulatory collapse may occur, but this is not the common finding.

Physical examination in the early stages ordinarily reveals a moderately ill patient with a mild inflammatory reaction of the upper respiratory passages. The remainder of the examination usually reveals no abnormal findings. The leukocyte count is normal. Up to this point, then, there is little in the history or physical findings to suggest a diagnosis of primary atypical pneumonia rather than one of ordinary undifferentiated acute respiratory disease. The one objective criterion which most authorities require to establish the diagnosis of primary atypical pneumonia is the presence of a pulmonary shadow or lesion by roentenogram.[13-20] In a large proportion of the patients such a lesion is demonstrable radiographically

* Presented by John H. Dingle, M.D., before the Health Officers Section of the American Public Health Association at the Seventy-second Annual Meeting in New York, N. Y., October 12, 1943.

† Members of the Commission are Drs. John H. Dingle, Director, T. J. Abernethy, G. F. Badger, J. W. Beard, N. L. Cressy, Major, M.C., A. D. Langmuir, C. H. Rammelkamp, J. M. Ruegsegger (resigned), and E. Strauss, 1st Lt., M.C.

early in the illness, before the appearance of associated physical signs. The infiltration commonly begins in the perihilar region and spreads in a wedge- or fan-shaped fashion toward the periphery of the lung field. It appears soft and either patchy or homogeneous in character. It may have an appearance suggesting atelectasis.[21] The process most often involves the lower lobe, but may affect any lobe or combination of lobes.

As the disease progresses, it is accompanied by a remittent fever which varies between 99° and 104° F., persists for approximately 3 to 8 days, and terminates by lysis. The pulse and respiratory rates are relatively low during the febrile period. Rather late in the disease characteristic subcrepitant "sticky" moist rales appear over the area of infiltration. They are best elicited after cough and deep breathing, and usually persist for days or weeks even after the pulmonary fields have cleared roentgenographically. Signs of definite consolidation are usually lacking. Convalescence is ordinarily prolonged but uneventful, and recovery is the rule (Figures 1, 2, 3).

The above description characterizes the usual case of primary atypical pneumonia. Variations in this picture, however, are extreme. "Unrecognized" cases have been detected by routine radiographic examination of soldiers on active duty. These cases have definite pulmonary lesions associated with minimal subjective or other objective evidences of infection. An estimate of

DAY 2 DAY 5 DAY 18

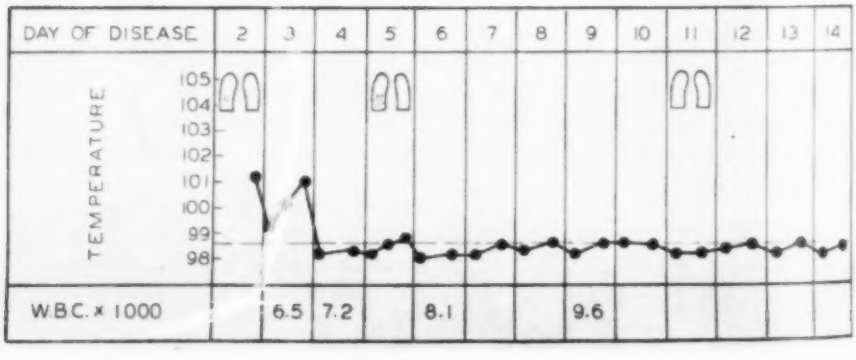

FIGURE 1—Clinical chart of patient with atypical pneumonia (mild infection)

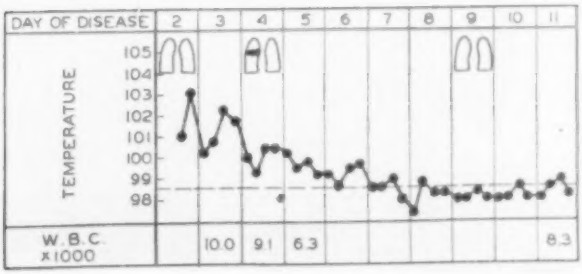

FIGURE 2—Clinical chart of a patient with moderately severe atypical pneumonia. Patient recovered after prolonged convalescence.

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the frequency of occurrence of these cases is shown by the following figures:

In a group of 2,814 radiologic examinations for officers' candidate school at Fort Bragg, 12 cases of primary atypical pneumonia were discovered, indicating a prevalence rate among apparently "normal" soldiers of about 0.4 per cent (Figure 4). Relapses or recurrences of infection are not unusual during the course. Rarely the moderately severe or severe illness may be complicated by secondary bacterial infection, pleural effusion, bronchiectasis, or signs suggestive of involvement of the central nervous system. A fatal outcome is extremely rare, but may occur, even in apparently uncomplicated cases.

Another group of cases warrants emphasis at this point, since it may provide one of the keys to the solution of the problems of common respiratory disease. The group has been termed "bronchitis resembling atypical pneumonia" or "suspected atypical pneumonia,"[11] and includes cases differing in no wise from the description given above, save in the absence of a pulmonary lesion demonstrable by roentgenogram and in the somewhat lesser severity of illness. The characteristic subcrepitant rales, occurring unilaterally in most instances, give evidence of pulmonary involvement. On the basis of the best clinical evaluation which could be made,[4, 5, 11, 22, 23] this group of cases seems to lie midway between primary atypical pneumonia and undifferentiated acute respiratory disease, without sharp border lines between the three groups (Figure 5). Epidemiological evidence appears to support this

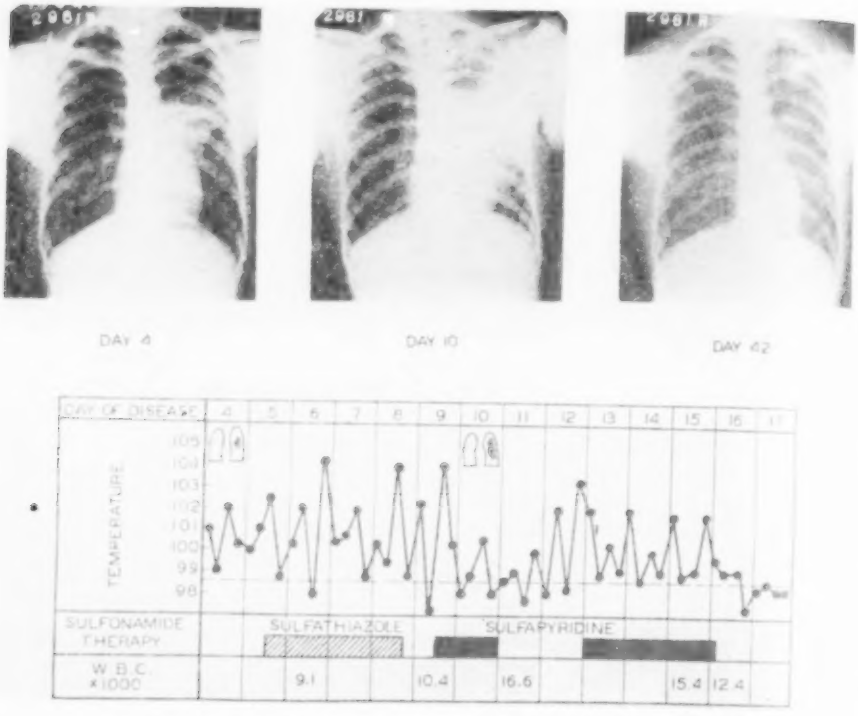

FIGURE 3—Clinical chart of a patient with severe atypical pneumonia. The febrile course was complicated by drug fever.

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interpretation. Such relationships, of course, provide no proof of common causation, but they indicate one direction for further investigation in an attempt to define the scope of the problems of recognition and control.

The pathological changes in the lungs of fatal cases [8, 24, 25] are those of an interstitial bronchopneumonia, which may or may not be hemorrhagic in character, of acute bronchitis, and frequently of acute necrotizing bronchiolitis. Throughout the parenchyma the predominant infiltrating cell is mononuclear, whereas in the bronchial and bronchiolar reaction, polymorphonuclear leukocytes are ordinarily abundant. Bacteria are usually absent from the parenchyma. Inclusion bodies are not seen. The pathological picture is thus not in itself distinctive, but is comparable to that found in the bronchopneumonia occurring in a number of virus diseases such as measles, in psittacosis, and in other infections.

The treatment of primary atypical pneumonia at the present time is symptomatic and supportive. Complete bed rest, a daily fluid intake of 3,000 ml. or more, and an easily digestible diet are advisable. Opiates may be given for cough, headache, and malaise, since in some patients these symptoms are difficult to suppress. Analgesic or antipyretic drugs with marked diaphoretic activity are inadvisable, particularly for patients in whom sweating is a prominent symptom. Oxygen therapy is desirable if anoxemia is severe. Chemotherapy with the

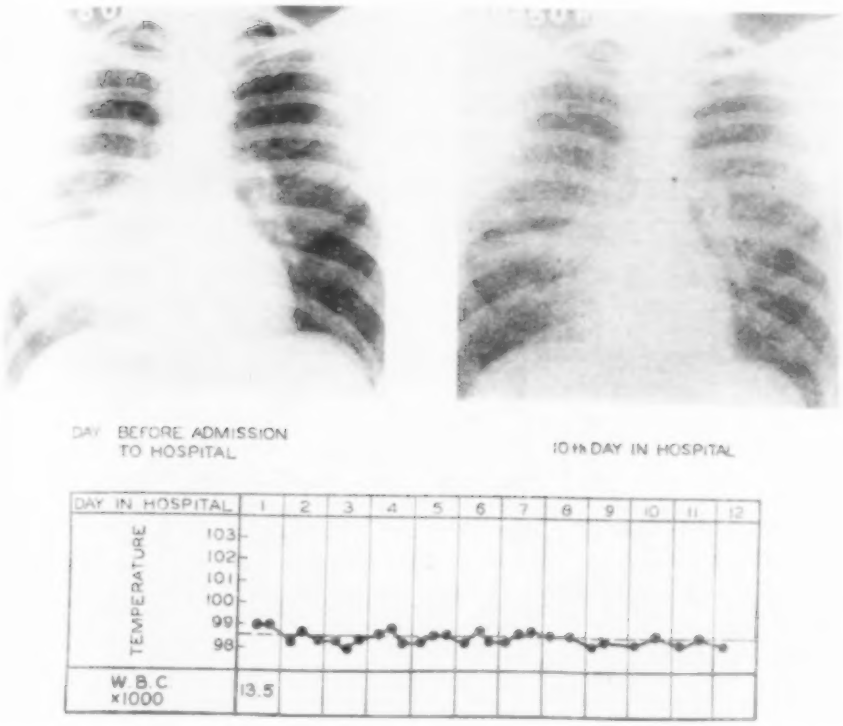

FIG. 4.—Unrecognized infection, probably atypical pneumonia, discovered by routine roentgenographic examination. There were no symptoms except a cough of 3 weeks' duration. No pulmonary signs were evident until the fifth day in the hospital. Recovery was uneventful.

(Published in *War Med.*, 3:223, 1943.)

sulfonamide drugs is of no benefit in uncomplicated cases and should be instituted only if secondary bacterial infection exists or, rarely, as an aid to diagnosis. A long period of convalescence is required in many cases because of the persistence of localized symptoms or signs, and of asthenia. There is no specific therapy available. The use of convalescent serum has been reported,[26, 27] but the evidence at present is insufficient to evaluate its effectiveness. Should primary atypical pneumonia prove to be a virus disease and thus be analogous to other virus infections, such therapy might not be expected to be of value from either practical or theoretical considerations.

EPIDEMIOLOGICAL ASPECTS

Primary atypical pneumonia is apparently a disease of widespread prevalence, both in endemic and epidemic form.[8, 10-12, 28] No race, color, or sex differences in incidence have been observed. The disease may affect any age group, but the majority of the outbreaks have been described in adolescents and young adults. In the armed forces[29-36] the syndrome has thus far been found wherever it has been sought, regardless of geographic boundaries. The incidence has varied, but in general has reflected the total incidence of respiratory disease.[37]

The source of infection is probably the oral and nasal discharges of per-

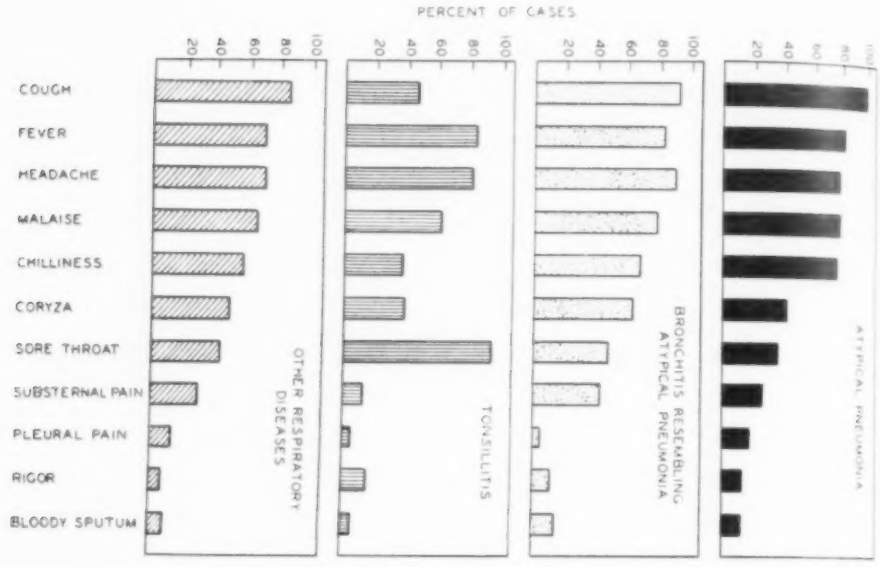

FIGURE 5—Frequency of certain symptoms in atypical pneumonia and other respiratory infections.

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sons with clinically recognized infections, of individuals with unrecognized infections, and possibly of healthy carriers. The mode of transmission is presumably by direct contact, or possibly by contact with articles freshly soiled with discharges from the respiratory tract, and by air-borne transmission. In the army camps thus far studied, there has been no evidence suggesting an intermediary vector such as food, water, or insects.

The incubation period is believed to be as long as 2 or 3 weeks, based primarily on the meager data available from a few instances of apparent case-to-case exposure. The period of communicability is entirely unknown.

Little is known about susceptibility and immunity to atypical pneumonia. It would appear that the population is not unusually susceptible in so far as clinically recognizable infections are concerned. Even during periods of relatively high incidence at an army post, for example, cases appear scattered throughout the personnel as if they were distributed at random, and case-to-case spread is usually impossible to determine. The picture is thus very similar to that obtaining with meningococcal meningitis. Individuals who may be exposed closely and repeatedly to patients, however, may show a higher incidence of infection. This has been noted in the professional staffs of hospitals, both under civilian [3, 26, 28] and military conditions.[11] Thus it might appear that susceptibility is low and that relatively high dosage, through close and repeated exposure, is necessary to produce the infection. It is, however, difficult to explain the spread of the disease on this basis. If "nonpneumonic" or "unrecognized forms" of the infection do exist as "suspected atypical pneumonia" and as undifferentiated respiratory disease, then susceptibility could be considered to be high and the distribution of the

"pneumonic form" could be explained.

The duration and nature of immunity are unknown. In all probability, any acquired active immunity is of short duration. During the past year at Fort Bragg, several instances of second attacks within a period of a year have been noted.

No specific measures for control are known at the present time, and only those general measures which can be instituted for any respiratory disease are available.

DIFFERENTIAL DIAGNOSIS AND ETIOLOGY

It is perhaps apparent from the above discussion that the final diagnosis of primary atypical pneumonia at the present time is an exclusion diagnosis, which can reliably be established only after other agents known to produce the same syndrome have been excluded, in so far as possible, in each individual case. Until a specific etiological diagnosis of primary atypical pneumonia can be made, certain representatives of each of the large groups of pathogenic microorganisms must be considered, including bacteria, fungi, rickettsiae, and viruses.

Bacterial pneumonias ordinarily are not difficult to differentiate from primary atypical pneumonia. The chief clinical features are abrupt onset, rigor, grossly bloody sputum, pleurisy, signs of pulmonary consolidation, and leukocytosis. Isolation of the infecting bacterium from the blood and sputum is usually readily accomplished, and such organisms as the pneumococcus, streptococcus, tubercle bacillus, staphylococcus, *Brucella abortus*, and *Pasteurella tularensis* may be obtained. In certain instances—approximately 10 per cent of hospitalized cases of primary atypical pneumonia—however, the differentiation may not be easy.[11] The onset may be sudden with rigor; the physical signs may be those of consolidation; a moderate leukocytosis may be present; or pneumococci, particularly of the "higher" types, or hemolytic streptococci may be isolated from the sputum. In these cases a therapeutic trial of the sulfonamides often is of aid in establishing the diagnosis (Figure 6).

Of the fungous infections, only coccidioidomycosis[39-41] is of appreciable significance in the differential diagnosis. Mild acute cases without demonstrable pulmonary involvement may simulate undifferentiated respiratory disease, and cases with pulmonary lesions may closely resemble primary atypical pneumonia. Chronic infections with granulomata and localized lesions are more readily distinguished. The localization of this infection geographically in southwestern United States, the use of coccidioidin as a skin test, demonstration of the development of antibodies in convalescent phase sera, and isolation of *Coccidioides immitis* all serve to identify this disease.

The possibility that rickettsial infection, other than the well known typhus and spotted fevers, might be confused with primary atypical pneumonia became apparent in 1939.[42, 43] Two years prior to this time, an apparently new disease entity, known as Australian Q fever, was reported from Queensland, Australia.[44] The following year a similar organism was found in ticks in Montana.[45] In 1939, the same rickettsia was isolated from a number of cases which occurred at the National Institute of Health and which presented the syndrome of primary atypical pneumonia. The evidence indicated that this organism, *Rickettsia burneti*, was the causative agent. Apart from this outbreak, however, there is thus far no evidence that the agent is responsible for more than a few sporadic human infections.

The fourth group of agents, the known viruses, presents a more complex situation. Presumably the viruses of influenza A and B may alone produce

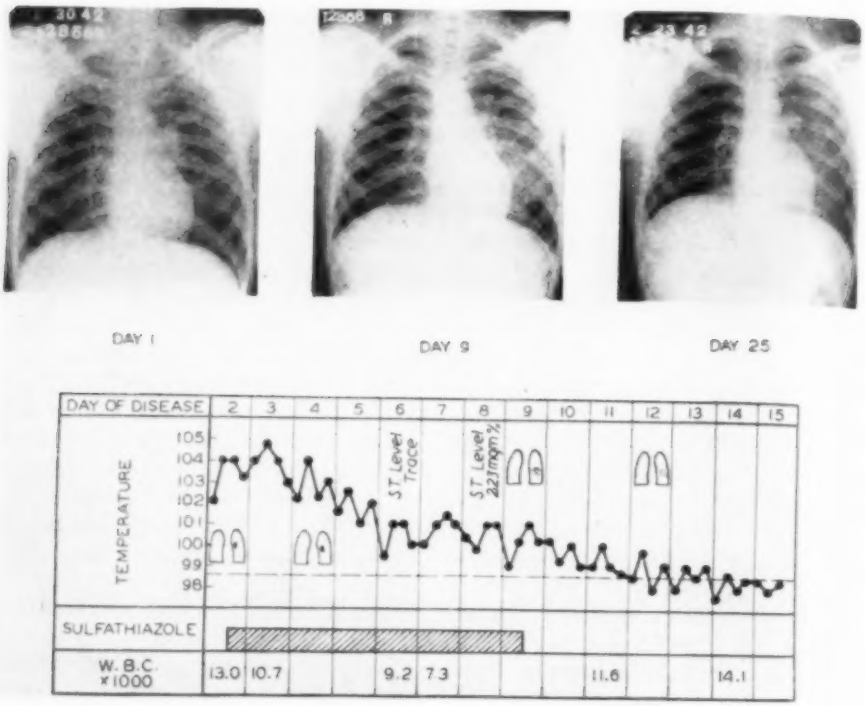
DAY 1
DAY 9
DAY 25
DAY OF DISEASE
2 3 4 5 6 7 8 9 10 11 12 13 14 15
TEMPERATURE
105 104 103 102 101 100 99 98
S.T. Level Trace
S.T. Level 22 mgm %
SULFATHIAZOLE
W.B.C. ×1000
13.0 10.7 9.2 7.3 11.6 14.1

FIGURE 6—Atypical pneumonia having some of the clinical characteristics of pneumococcal pneumonia

pulmonary involvement, although the evidence in this regard is as yet scant.[46, 47] Certainly the clinical and epidemiological features of influenza during an epidemic are quite distinct from those of primary atypical pneumonia, yet in an individual case the differentiation may be difficult, if not impossible. It is therefore necessary to employ laboratory aids in diagnosis, the simplest of which is to determine the development of specific influenzal antibodies by comparing acute and convalescent phase sera.

Psittacosis, which has long been known to be a virus disease, has more recently come to be considered as a group of diseases caused by the "psittacosis" or "ornithosis" group of viruses. Viruses of this type have now been isolated from a number of different species of birds and animals,[47, 48] including man.[49, 50] Where a causal relationship has been established in patients, the clinical illness has in general been more severe although similar to that of primary atypical pneumonia. Attempts to relate this group of agents causally to primary atypical pneumonia occurring at Camp Claiborne, Fort Bragg, and other army posts, however, have been unsuccessful, in spite of the isolation of several strains of virus.[51] Confirmatory serological evidence could not be obtained from the patients' sera; in other words, an increase in antibodies was not demonstrable in the convalescent phase sera, and the level of antibodies appeared to correlate more with race and probable venereal exposure than with the respiratory disease under investigation. The close anti-

genic relationship of the virus of lymphogranuloma inguinale to the psittacosis group of viruses seems to provide the most logical explanation.[51-53] In addition, the possible saprophytic existence of the virus in man must be considered.

One other virus should be mentioned, namely, that of lymphocytic choriomeningitis. While the relation of this agent to respiratory illness has not been satisfactorily established, there seems little doubt that it can produce an influenza-like or grippe-like disease,[54] and in certain instances can cause pulmonary infiltration.[55]

It should be emphasized again that the above mentioned agents, which can be recognized, are actually responsible in the Army for an almost insignificant number of cases showing the syndrome of primary atypical pneumonia. In the great majority of the cases no evidence has been obtained that any of the known bacteria, fungi, rickettsiae, or viruses play an etiological rôle.

The search for new agents has not been neglected. A number of groups of investigators have reported the isolation of viruses from throat washings, sputum, or blood of patients with primary atypical pneumonia. These agents have been obtained by inoculation of ferrets and mice,[56] mongooses,[57] chick embryos,[57] cats,[58, 59] cotton rats,[60, 61] guinea pigs,[62] and mice after preliminary growth in tissue culture.[63] In no instance, however, has there been established a clear-cut relation between any one of the agents and the human disease.

The possibility that a laboratory test may be of value in the recognition of primary atypical pneumonia is suggested by recent reports [64-66] of the presence of cold agglutinins for Group O human erythrocytes in the sera of some patients. The specificity and sensitivity of this reaction has not yet been determined in a sufficient number of cases of primary atypical pneumonia and other respiratory infections to permit satisfactory evaluations. The data thus far obtained in the Commission laboratory at Fort Bragg indicate that the reaction may be positive in 25 to 50 per cent of cases of primary atypical pneumonia, and up to 10 per cent of cases of other types of respiratory disease, depending on the technic employed.

In summary, an attempt has been made to review the present status of knowledge concerning primary atypical pneumonia from the clinical, epidemiological, and etiological aspects. The importance of this problem to the military forces can only be estimated. In spite of the recognized difficulties in accurate diagnosis and reporting, the total number of cases recorded in troops in the continental limits of the United States from March, 1942, to May 8, 1943, was approximately 26,000.[67] The disease is not a significant factor in mortality, but is "an important cause of temporary disability, resulting in loss of man power hours and loss of days from training and other duties."[67] Primary atypical pneumonia is, numerically at least, the most important form of pneumonia affecting the armed forces today, and should it subsequently prove to be but a severe form of a more common undifferentiated respiratory disease, it will be one of the most important problems in therapeutic and preventive medicine facing the medical military services.

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Antibiotic Substances, Production by Microörganisms–Nature and Mode of Action*

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THE mounting interest in the production, utilization, and chemical nature of penicillin has recently focused considerable attention upon the whole subject of antibiotic substances and their formation by microörganisms. Although the nature and activities of some of these substances have been known for many years, the wide horizons that have now been opened for their practical utilization in combating human and animal diseases have attracted the attention of the bacteriologist, the chemist, the public health worker, and the clinician, not to mention the manufacturer who has envisioned a repetition, on a vastly wider scale, of the possibilities opened by the discovery of the sulfa drugs.

Formation and nature of antibiotic substances — Antibiotic substances are antimicrobial agents, produced by a variety of microörganisms found among the filamentous fungi or molds, yeasts, actinomycetes, and bacteria. They are chemically and biologically distinct from the common antiseptic and germicidal agents, although certain synthetic preparations may have properties similar to those of antibiotic agents. They are primarily bacteriostatic in nature, that is, they inhibit the growth of bacteria, whereas their bactericidal activities are of only secondary consideration and require a longer period of time than that needed for ordinary disinfectants.

One of the characteristic properties of antibiotic agents is their selective antibacterial action. Some affect largely Gram-positive bacteria and act only to a very limited extent upon Gram-negative organisms; others, however, have the capacity of inhibiting the growth of certain bacteria belonging to each of these groups, and act only to a limited extent against other organisms within the same group. The selective action of antibiotic substances is not only qualitative but also quantitative in nature, much larger concentrations being required to inhibit the growth of some bacteria than of others. The term "antibiotic spectrum" is, therefore, justifiably used to designate a range of activity of an antibiotic substance against a number of bacteria selected from various representative Gram-positive and Gram-negative groups.

Antibiotic substances vary greatly in their chemical nature, in their mode of action upon bacteria, in their toxicity to animals, and in their *in vivo* vs. *in vitro* activity. Some are destroyed by boiling, by exposure to light, and by

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passage through various filters, whereas others are resistant to heat and to ultraviolet rays. Some are readily adsorbed by various adsorbing agents, such as active charcoal and infusorial earth; they usually can be removed from these by means of special solvents, such as ether, alcohol, chloroform, acetone, acids, or alkalies.

In order to obtain an antibiotic substance, an antagonistic organism is selected for its specific antibacterial activity and grown on an organic or a synthetic medium. The period of incubation usually varies from 3 to 20 days, and the temperature from 20° to 30° C. Since these organisms are aerobic in nature, proper aeration of the culture is essential; hence, shallow layers of liquid culture media for stationary cultures or forced aeration for submerged cultures are used. The formation of the antibiotic substance is greatly influenced by the strain of the organism, the composition of the medium, and the conditions of growth. Some antagonistic microörganisms produce more than one antibiotic substance. It has also been definitely established that some substances or closely related compounds may be produced by more than one organism.

Saprophytic and pathogenic microorganisms—There is no plant or animal now living that is not subject to infection by a number of bacteria, fungi, and protozoa, resulting in numerous diseases and epidemics. These disease producing microörganisms sooner or later find their way into the soil and into water basins, either in the excreta or in the dead and infected residues of the host. Fortunately, these natural substrates are not recognized at the present time as carriers of most of the common infectious diseases of man and animals. As a result of extensive investigations, the conclusion has been reached that most of the disease producing agents do not survive long in the soil, but die out there at a rather rapid rate, depending on the nature of the organism, the nature of the soil, climatic and other conditions.

The antagonistic effects of saprophytic soil microörganisms upon pathogenic bacteria and fungi were at first visualized as resulting from competition for food between these two groups. It was soon recognized, however, that this was not a sufficient explanation for all the observed phenomena, included by Ward [15] under the general term "antibiosis." Organisms living in associations were found to develop frequently certain characteristics that they did not possess when grown in pure culture. Schiller,[10] for example, observed that when beer yeasts were placed together with tubercle bacteria in a sugar-containing but nitrogen-free medium, the former developed antagonistic properties toward the latter and used the latter as a source of nitrogen. The antagonists secreted a bacteriolytic substance that was also active outside the living cells.

Dubos [4] used the method of enriching a soil with cultures of living pathogenic organisms in order to stimulate the development of antagonists that brought about the destruction of the pathogens. In order to isolate an antagonist from an ordinary soil or from one thus enriched, it is sufficient to inoculate a suspension of living bacteria with the soil, or plate out the soil on an agar medium with these living bacteria as the major nutrient, as suggested by Waksman and Woodruff.[13, 14] A number of different antagonistic organisms have thus been isolated.[12]

The most important organisms known at the present time capable of producing antibiotic substances can be classified into four broad groups: 1. non-spore-forming bacteria, comprising *Pseudomonas aeruginosa* and various others; 2. spore-forming bacteria including *Bacillus brevis*, *Bacillus mesentericus*

and *Bacillus mycoides;* 3. filamentous fungi, especially members of the genera *Penicillium* and *Aspergillus;* and 4. actinomycetes, especially the aerial mycelium producing types of the genus *Streptomyces.*

The antagonistic action of *Pseudomonas aeruginosa* was first established in 1888 by Freudenreich,[8] who believed that the lack of growth of various bacteria in the sterile filtrate of the antagonist was due to the exhaustion of nutrients in the medium. The filtrate possessed bacteriolytic properties, believed to be due to an enzyme designated as "pyocyanase" and to the pigment pyocyanin. Since pyocyanase is thermostable, not sensitive to pH change and not precipitated by ammonium sulfate and alcohol, but is soluble in alcohol, a lipoid-like nature has later been suggested. This organism is now recognized as producing three antibiotic substances, including also hemipyocyanin. These substances differ in chemical nature and in their mode of action upon bacteria.

The production of antibiotic substances by spore-forming bacteria has long been established. This culminated in the isolation by Dubos[5] of the antibiotic agent tyrothricin, which consists of two distinct substances, gramicidin and tyrocidine; these differ in their chemical nature, mode of action upon bacteria, and toxicity to animals.

Among the fungi, various green molds belonging to the genera *Penicillium, Aspergillus,* and *Trichoderma* have long attracted attention as organisms possessing antibacterial properties. Vaudremer,[11] for example, demonstrated in 1913 that *Mycobacterium tuberculosis* loses its virulence in the presence of *A. fumigatus* or its products.

The ability of a member of the *Penicillium* group to produce an antibacterial substance was first established by Fleming[6] in 1929. This substance was designated as "penicillin." Various strains of *P. notatum* and *P. chrysogenum* are now known to produce this antibiotic agent. Clutterbuck, Lovell, and Raistrick[3] reported, in 1932, that these fungi produce three compounds, penicillin, a protein, and a pigment, only the first of which showed antibacterial properties. It was active largely against Gram-positive and certain Gram-negative bacteria, but not against most other Gram-negative bacteria. It was non-toxic to animals and was active *in vivo.*

This work attracted very little attention for nearly a decade until a group of Oxford chemists and pathologists[1,2] decided in 1940 to reëxamine the potentialities of penicillin for the treatment of various diseases. These investigations resulted in a series of contributions concerning the isolation, antibacterial properties, chemical nature, and mode of action of this important antibiotic substance.

It has been recently established that *P. notatum* produces, in addition to penicillin, another antibacterial factor, active not only against Gram-positive but also against Gram-negative bacteria. This substance was designated variously as the *Escherichia coli* factor, penatin, notatin, and penicillin B. It is a protein and functions as a glucose-oxidase. It has also been demonstrated that other fungi, notably members of the *A. flavus* group, produce a substance designated as flavicin that is similar to if not identical with penicillin.

Actinomycetes yielded several antibiotic substances; the most promising of these is streptothricin[14] which is active against many Gram-negative as well as Gram-positive bacteria, has a low toxicity to animals, and is active *in vivo.*

A fairly large number of other antibiotic substances have now been isolated, but many of these are toxic to animals, possess undesirable physical, chemical, or biological properties, or

TABLE 1

Summary of Chemical and Biological Properties of Some of the More Important Antibiotic Substances

	Organism	*Active Against Bacteria*	*Properties*
Actinomycin A	*A. antibioticus*	Selective quantitative action.	Soluble in ether and alcohol, not in petrol ether; orange colored; highly toxic; thermostable; nitrogen bearing ring compound.
Aspergillic acid	*A. flavus*	Active against both Gram-positive and Gram-negative bacteria.	Soluble in alcohol, ether, acetone, not in petroleum ether. Acid nature. m.p. about 96° C.; m.w. 224; about 13 per cent nitrogen.
Citrinin	*P. citrinum*	Non-selective.	Soluble in water and in alcohol; precipitated by acid; quinone.
Clavacin	*A. clavatus*	Active against Gram-negative and some Gram-positive bacteria. Highly bactericidal.	Soluble in ether, chloroform, alcohol and water. Toxic.
Flavacin	*A. flavus*	See penicillin.	Similar in all respects to penicillin.
Fumigatin	*A. fumigatus*	Largely active against Gram-positive bacteria.	White, needle-shaped crystals; m.p. 185°-187°; soluble in alcohol, limited solubility in water.
Gliotoxin	*Trichoderma, Gliocladium*	Non-selective; fungicidal and bactericidal.	Soluble in chloroform, benzol alcohol, sparingly in water; contains nitrogen and sulfur.
Gramicidin	*B. brevis*	Lytic to Gram-positive bacteria.	Soluble in ether and acetone; thermolabile; active *in vitro*; polypeptide.
Notatin	*P. notatum* and *P. chrysogenum*	On Gram-positive and Gram-negative bacteria.	Insoluble in organic solvents, soluble in water; acts, in presence of glucose.
Penicillic acid	*P. puberulum*	Active against Gram-positive and also upon Gram-negative bacteria.	Colorless; soluble in water.
Penicillin	*P. notatum* and *P. chrysogenum*	Acts largely upon various Gram-positive aerobic and anaerobic bacteria.	Soluble in alcohol and water; thermolabile; active *in vitro*; low toxicity.
Trichothrycin	*Pr. gardneri*	Acts primarily upon Gram-positive bacteria.	Soluble in ether, benzene and water. Toxic.
Pyocyanase	*Ps. aeruginosa*	Lytic action on many Gram-positive and Gram-negative bacteria.	Thermostable; lipoid; activity largely due to unsaturated fatty acids.
Pyocyanin	*Ps. aeruginosa*	Bactericidal action largely against Gram-positive bacteria.	Chloroform-soluble, blue pigment; thermostable.
Streptothricin	*A. lavendulae*	Active on various Gram-negative and some Gram-positive bacteria.	Soluble in water and in acid alcohol, not in ether; organic base; thermostable. Low toxicity; active *in vivo*.
Tyrothricin	*B. brevis*	Lytic to Gram-positive and Gram-negative bacteria.	Soluble in alcohol, not in ether; thermostable; polypeptide.

have not as yet been studied sufficiently.

Chemical nature and activity of antibiotic substances—The antibiotic substances do not comprise a single group of chemical compounds but vary greatly in composition. Since very few of them have so far been crystallized and their chemical nature established, any system of classification of these compounds on the basis of their chemical relationship can only be tentative (Table 1). The following seven groups may now be recognized:

1. Polypeptides and proteins, including tyrothricin, lysozyme, actinomycetin, and notatin
2. Sulfur-bearing compounds, comprising gliotoxin and several others
3. Pigments, which include pyocyanin, hemipyocyanin, prodigiosin, chlororaphin, toxoflavin, and actinomycin
4. Lipoids and lipoid-like bodies. (These comprise a number of compounds produced by different types of microörganisms; only some of which, such as pyocyanase, have been investigated.)
5. Quinones and quinone-bearing compounds, including citrinin, penicillic acid, and fumigatin

6. Organic bases, comprising streptothricin and proactinomycin
7. Agents which are known to be produced by various microörganisms but which have not been isolated or studied in detail

The methods for measuring the activity of antibiotic substances are based upon their bacteriostatic nature, their selective action against various bacteria and other microörganisms, and the mechanism or mode of their action. Some of the antibiotic substances are also fungistatic, and even fungicidal in nature, like gliotoxin, actinomycin, clavacin, hemipyocyanin, the *Bacillus simplex* factor, and others.

On the basis of their toxicity to animals, the antibiotic substances can be divided into three groups: (1) Substances non-toxic to higher animals or possessing but little toxicity, when 0.5 gm. or more per kg. weight of animal is tolerated; here belong penicillin, citrinin, pyocyanase, streptothricin, actinomycetin, and fumigacin. (2) Substances that are fairly toxic to animals, including tyrothricin, notatin, and gliotoxin; although limited information precludes establishment of a toxic zone for these, a range of 0.1 to 0.5 gm. per kg. can be suggested tentatively. (3) Highly toxic compounds, such as actinomycin, clavacin and aspergillic acid; these are usually more toxic than 0.1 gm. per kg.; for many, such as actinomycin, as little as 0.15 mg. per kg. weight is toxic.

Of the various antibiotic agents, penicillin is the only one that has so far found an extensive chemotherapeutic application.[9] It is effective against hemolytic streptococcus and pneumococcus infections, as well as various staphylococcal infections; it is used in controlling local lesions of the eye caused by *Staphylococcus aureus;* however, it has no effect upon infections caused by *Mycobacterium tuberculosis, Trypanosoma equiperdum,* and influenza virus. It is effective against sulfonamide-resistant strains of pneumococci, although pneumococcus cultures can build up resistance against penicillin. In order to overcome the instability of penicillin and its rapid excretion, esters have been prepared which are said to be more stable and even offer promise of use by oral administration. Next to penicillin in chemotherapeutic value is tyrothricin which is being utilized for the control of mastitis in cattle and certain local infections. Pyocyanase was extensively used at one time for the treatment of various infections, but because of its instability, the variability of the organisms producing it, and insufficient knowledge concerning the conditions governing its formation, its use has been discontinued or been very greatly limited.

Mode of action of antibiotic substances—The mode of action of antibiotic substances upon bacteria consists largely in interfering with cell multiplication. This may be accompanied by a marked effect upon certain essential metabolic processes. On the basis of the limited information now available, the following mechanisms may be tentatively presented:

1. The antibiotic substance interferes with bacterial cell division, thus preventing further growth of the organism; the cell, unable to divide gradually dies. It has been shown by the use of the manometric method, that certain bactericidal agents in bacteriostatic concentrations may have no effect on the metabolic rates of bacteria; however, they inhibit cell multiplication.
2. The antibiotic substance interferes with the metabolic processes of the microbial cells by substituting for one of the essential nutrients.
3. The antibiotic substance may interfere with the vitamin utilization of the organism. the staling effect of a medium, frequently spoken of in the case of protozoa as "biological conditioning" of the organism, may serve as an illustration; such effects have been overcome by the addition of a mixture of thiamin, riboflavin and nicotinamide.
4. The antibiotic agents bring about the

oxidation of a metabolic substance which must be reduced in the process of bacterial nutrition, or otherwise modifies the intermediary metabolism of the bacterial cell.

7. The agent combines with the substrate or with one of its constituents, which is thereby rendered inactive for bacterial utilization.

8. The agent competes for an enzyme required by the bacteria in order to carry out an essential metabolic process.

7. The agent interferes with various enzymatic systems, such as the respiratory mechanisms of the bacterial cells, especially the hydrogenase system; penicillin was shown capable of inhibiting the activity of urease.

8. The antibiotic substance may inhibit directly cellular oxidations, particularly those involving nitrogenous compounds, similar to the action of propamidine.

9. The antibiotic substance acts as an enzyme system and produces, in the medium, oxidation products, such as peroxides, injurious to the bacterial cell. The glucose oxidase produced by *P. notatum* catalyzes the following reaction:

$$\text{Glucose} + O_2 \rightarrow \text{Gluconic acid} + H_2O_2$$

10. The antibiotic substance favors certain lytic mechanisms in the cell, whereby the latter is destroyed; this mechanism may be either secondary or primary in nature.

11. The antibiotic substance affects the surface tension of the bacteria, acting as a detergent.

12. Bacteria subjected to the action of an antibiotic substance may develop mechanisms that render them resistant to the action of the substance.

13. Some bacteria may produce an enzyme, such as penicillinase, that brings about the destruction of the antibiotic substance.

SUMMARY

The utilization of antagonistic microorganisms, directly or through the production of antibiotic substances, offers three distinct potentialities to help man in overcoming his ills as well as those of his animals and of his crops:

1. Domestication of microörganisms for disease control.

2. Isolation of new chemotherapeutic agents for combating human and animal diseases.

3. Utilization of the activities of microorganisms for combating various plant diseases.

We are faced with a new field of research, which overlaps the fields of biology and chemistry and unites medicine with soil science. Many secrets of nature not sufficiently understood heretofore, will thereby be unraveled and new agents that may help man in combating diseases and epidemics discovered. This new field offers further great possibilities for the study of the nature and physiology of the bacterial cell, which may lead to a better understanding of the way of life of the smallest and, in many respects, the most interesting of the living systems.

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UNRRA's Public Health Plans

James A. Crabtree, M.D., acting chief of the Health Division of the United Nations Relief and Rehabilitation Administration, Washington, announced on February 21 the plans that are being made to deal with public health and nutritional problems in the occupied countries. Although it will be difficult to predict exactly what the conditions will be, Dr. Crabtree said that it was possible to make some intelligent guesses on what the conditions under a variety of premises might be, including what might be found under a completely scorched-earth policy.

Dr. Crabtree believed that the number one problem would be starvation, with all its relationships to public health, and he believed that increased death rates from maternal and infant causes, from malaria, and typhus, and from tuberculosis would have to be dealt with.

Dr. Crabtree felt that it was safe to predict that the breakdown of sanitary safeguards, together with crowding, lack of shelter, lack of clothing, fuel, soap, and the great movements of population would certainly result in epidemics. He said that some progress was being made on the assembling of personnel for these purposes. At present the UNRRA supply problem is more advanced than the plans for personnel, but UNRRA is fully aware that medical supplies would be worth little without medical service. However, a few teams of physicians, nurses, engineers, and other health specialists have been organized and the plan will be to send into each country as it is liberated a relatively small, well rounded team of experts in various specialties of public health to consult with and to assist national governments in building up and strengthening their own medical care services and facilities. In addition special teams will have to be organized to deal with certain special problems such as epidemics and diseases that have been introduced into the country for the first time. Dr. Crabtree said that, while some of the occupied countries would need only the help of such general and special teams of workers, others which had been "scorched" of professional personnel might need a substantial number of doctors and nurses to come in and actually to help take care of the sick.

Human Serum Albumin as a Stabilizing Agent for Schick Toxin*

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A LITTLE over a decade ago it was found that gelatin or peptone added to diluted diphtheria toxin would prevent rapid deterioration of the toxin. This made it possible to distribute diluted Schick toxin ready for use. One of the most widely adopted diluents in this country and elsewhere was 0.25 per cent Witte peptone, recommended by White, Bunney, and Malcolm in 1932.[1]

Beginning about 1934 there appeared scattered reports of acute generalized urticarial reactions immediately following the Schick test. These reactions were often severe and distressing, but never fatal. All cases showing reactions, on whom adequate histories were reported, had previously been Schick tested or had received immunizing injections. At the Antitoxin and Vaccine Laboratory we have received reports of 15 such reactions in the past 10 years, two of which have been observed by one of us. Similar reactions, following the injection of diphtheria or tetanus toxoid, have been reported by various workers. The conclusion of several investigators has been that the cause of these reactions is, in many instances at least, the presence of Witte or Berna peptone employed as a diluent or as a constituent of the medium.

In order to avoid these occasional reactions, we sought a satisfactory stabilizing agent of human origin which would itself be stable. About this time small quantities of human serum albumin were made available to us through the courtesy of Dr. E. J. Cohn of the Harvard Medical School. His material was prepared under contract with the Committee on Medical Research of the Office of Scientific Research and Development. Human serum had been recommended as a stabilizing agent several years earlier by Glenny and Stevens,[2] but we preferred to work with human albumin, since the albumin represented a highly purified preparation of what was known to be the most stable of the important serum proteins.

A number of batches of Schick toxin have accordingly been made, using human albumin as a stabilizing agent. All of these preparations were made with Glenny, Pope, and Waddington's borate buffer [3] as the fluid base. Potency has been tested (except where otherwise noted) by injection of 5 ml. subcutaneously into each of five guinea pigs of m.l.d. weight, observing the time of death of each animal. Stability of the toxin so prepared was, with but few exceptions, determined by heating samples for 24 hours at 37° C. (the official N.I.H. test) and at 41° C. (suggested by Glenny and Stevens). We have found the latter to be a very useful test of stability and one which gives an

* Presented before the Laboratory Section of the American Public Health Association at the Seventy-second Annual Meeting in New York, N. Y., October 13, 1943.

TABLE 1

Efficiency of Albumin as a Stabilizing Agent Potency Tested by Subcutaneous Injection of 5 ml. into Guinea Pigs

Experiment	Stabilizer: Agent (see note 1)	Stabilizer: Concentration Per cent	Average Days Till Death of Guinea Pigs (see note 2): Unincubated	Incubated for 24 Hours at: 37° C.	Incubated for 24 Hours at: 41° C.
I. Varied Albumin Concentration Toxin Lot 66F, 0.2% Merthiolate 0.01%	Albumin ⇄ 19	0.2	3.0	3.6	3.6
	" "	0.1	4.7 *	3.7	3.7 ‡
	" "	0.05	4.1 ‡	4.0	4.0 ‡
II. Same as Exp. I except for use of Albumin Lot 45	Albumin ⇄ 45	0.2	3.7	3.4	3.6
	" "	0.1	3.6 *	3.6	4.1
	" "	0.05	3.4	4.9 †	5.1 ‡
III. Same as Exp. II except for use of Toxin Lot 44A, 0.38%	Albumin ⇄ 45	0.1	3.5	3.5	4.2
	" "	0.05	4.0	4.0	3.2
IV. Same as Exp. III except for use of Albumin Lot P1	Albumin P1	0.2	3.6	....	3.8
V. Same as Exp. IV except for use of Phenol, 0.5% as preservative	Albumin P1	0.2	2.6	....	All survived
VI. Like Exps. III and IV except for omission of organic stabilizing agent	None	....	3.7	1 died 4 survived	1 died 4 survived
VII. Three Berkefeld-filtered lots: Toxin—Lot 44A, 0.37%	Albumin ⇄ 19	0.05	4.6	4.5	4.5
" —Lot 44A, 0.38%	" "	0.1	3.2	3.3	4.1
" —Lot 44A, 0.35%	" P1	0.1	4.3	4.5	4.1
VIII. Three Peptone lots: Preservative: Phenol 0.5%	Witte Peptone	0.25	4.4	....	6.1
" " "	" "	0.25	5.1	....	5.6
Like III & IV except for stabilizer	" "	0.25	4.9	....	4.8

Note 1. All albumin-stabilized lots were diluted in Glenny, Pope and Waddington's borate buffer.

Note 2. Five guinea pigs were used for each test except when otherwise indicated as follows:

* 3 guinea pigs
† 4 guinea pigs
‡ 6 guinea pigs

answer in a short time. For a preservative, merthiolate 1:10,000 was used except in certain experimental batches.

The principal findings have been as follows:

1. For adequate protection of diluted diphtheria toxin, 0.05 per cent albumin is apparently insufficient, whereas 0.1 per cent is adequate but is apparently not quite as good as 0.2 per cent.

2. The above does not apply where phenol is used as a preservative, since concentrations of albumin as high as 0.2 per cent have failed to prevent deterioration in phenolized Schick toxin incubated at 37° C. for 24 hours.

3. Several batches of Schick toxin stabilized with albumin have shown no significant deterioration after exposure to 41° C. for 24 hours. This represents at least as high a stability as has been observed with any peptone-diluted toxin of our preparation.

4. No significant differences have been observed in Schick toxin prepared with three different lots of albumin or with two different lots of toxin.

5. Tests of albumin-diluted Schick toxins, according to the League of Nations standardization, have shown no significant differences from peptone-diluted toxin.

6. Duplicate Schick tests with albumin and peptone Schick toxin on 215 individuals, read at 4, 7, and, in some cases, 5 days, have shown certain minor differences. Opportunities for performing these tests were provided through

the kindness of Dr. Harold Norton and Dr. Roderick Dexter of the Massachusetts Department of Mental Health and Professor J. Howard Mueller of the Harvard Medical School. The albumin-diluted toxin as a rule:

a. Gave a brighter red positive reaction with more sharply defined borders.

b. Averaged somewhat smaller (209 sq. mm. as against 360 sq. mm. in comparable duplicate tests on 30 subjects).

c. In a few instances showed less tendency to fade by the 7th day.

d. Disagreed with the peptone reading in 13 of 70 presumably positive individuals. All of these disagreements represented a positive or combined albumin toxin reaction and a negative or pseudo peptone toxin reaction. Of the 8 of these 13 subjects on whom simultaneous serum antitoxin titers were performed, 6 were below 1/400 unit, indicating the validity of the albumin toxin readings.

Other studies on the material are being carried out and will be reported when completed. Meanwhile we recommend this preparation for further trial in the belief that it will prove suitable for general use.

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Surveys of the Nutrition of Populations*

3. The Vitamin A Nutrition of a Rural Population in Middle Tennessee

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In previous papers the general nature of the study has been described and results with respect to the energy principle (calories) and protein have been reported. This communication describes the nutrition of the population with respect to vitamin A.

Methods

Dietary—The general procedure for recording the intake of food has been described.[1] For calculating the amount of vitamin A the tables of Booher, Hartzler, and Hewston [2] were used. In each instance the value most closely and clearly applicable in respect to season, variety, preparation, etc., was chosen. In the few instances where values for foods were lacking in the above table they were taken from other sources and when no values for a food could be found one was assigned arbitrarily on the basis of similarity to other food or on similar grounds.[1] In no case did these arbitrarily assigned values affect the results significantly.

History and Physical Examination—The general procedure for obtaining the medical history and for the physical examination has also been described.[3] For vitamin A, particular attention was paid to the history of such characteristic vitamin A deficiency diseases as xerosis, xerophthalmia, and the dermatosis; to night blindness; and to the symptoms of pre-xerosis, such as photophobia, burning and dryness of the eyes, asthenopia, and conjunctivitis. The taking of cod liver oil and other vitamin A preparations was also noted.

On the physical examination particular attention was directed to the skin and hair, to lesions of the eyes, and to vaginal discharge. A number of symptoms and signs such as the history and presence of respiratory infections, disorders of growth and development, abnormalities of the teeth and dentition and changes in the mucous membranes of the mouth and upper respiratory passages, whose significance to vitamin A deficiency is uncertain, were noted but are not analyzed here.

None of the symptoms and physical signs except those of the fully developed deficiency diseases are specific or pathognomonic for vitamin A deficiency, though some are of relatively high diagnostic value. It was necessary therefore to review these symptoms and signs in the light of the other evi-

* The studies referred to herein were conducted under the auspices of the International Health Division of the Rockefeller Foundation of New York City by the Nutrition Unit of the Departments of Medicine and Biochemistry of the Vanderbilt University School of Medicine, Nashville, Tenn.

data obtained from the history and physical examination, and determine whether such signs and symptoms represented a vitamin A deficiency or were due to some other cause. This is clearly a matter of clinical judgment and must be based on experience with the manifestations of vitamin A deficiency -tables, the range of normal variations, and other causes of similar signs and symptoms. The decisions were made after a careful examination of each individual record without knowledge of the results of the dietary or laboratory studies, the original observations having been made by experienced examiners with an eye to such decisions. It is obvious, of course, that the probable correctness of the decision in each case must vary with the degree of specificity of the symptom or sign.

Laboratory Tests — The laboratory tests and special procedures included a test of visual adaptation to dim light (night blindness) and a determination of the amount of vitamin A and carotene in the blood serum.

The tests of dark adaptation were made with a Hecht and Shlaer adaptometer,[3] measuring the rod threshold after a period of 20 minutes in complete darkness. Subjects, singly or in groups of 3 to 5, were seated in a completely dark room for 20 minutes after having been exposed to ordinary indoor light. After the 20 minute period of adaptation to the dark the light perception was tested according to the technic of the instrument. The purpose and nature of the test were explained carefully to each subject beforehand and every effort was made to secure satisfactory cooperation. At least three readings were made and the minimum value was taken. When there was any reason to believe the test was unsatisfactory it was discarded. Children under 4 were usually not tested and many above that age were unsatisfactory. An extensive experience with the instrument in studying such things as the learning factor and the influence of age, and the use of the complete test (bleaching and regeneration) in the examination of many patients with a wide variety of diseases and complaints, contributed to a successful application of the test. Most of the tests were made by the examining physicians and all were made at the hospital where a suitable dark room and electric current were available. The machine bears the manufacturers' number 18 and does not have gelatin cemented lenses. The lamp was carefully standardized with the help of a physicist and checked at suitable intervals.

The upper normal value commonly used is 3.5 ± 0.3 micromicro lamberts. Because, however, of some unavoidable variability in the subjects' response in such a test and because of what appears to us to be a slight but definite increase in threshold with age we have taken 4.0 micromicro lamberts as the upper limit of normal. It should be remembered that the error of the instrument itself is probably less than the unavoidable error of the subject's response.

The concentration of carotene and vitamin A in the blood serum was determined by May's method.[4] We found this micro-method may give slightly lower values than the macro-methods, but with a carefully controlled technic reliable values can be obtained. The lower limit of normal has been taken to be 70 International Units per 100 ml. of serum except in infants under 1 year of age for whom the value is 45 units.[5]

Blood was obtained from the sample drawn at the time of the physical examination in most instances at least 3, usually 4–6 hours, after the last meal. About 30 ml. of venous blood was drawn with the least possible stasis in dry luer syringes. About 2 ml. was placed in a separate vial with an anticoagulant for hemoglobin determinations, etc. The remainder was placed

TABLE 1

Distribution of Average Daily Intake of Vitamin A Among Persons in the Survey According to Age, Sex, and Race, Together With the Number and Percentage of Subjects With Intake Below Recommended Allowances *

Vitamin A International Units	Age in Years										
	1–3 M-F †	4–6 M-F	7–9 M-F	10–12 M-F	13–15 M	13–15 F	16–20 M	16–20 F	21+ M	21+ F	Total
					White						
<500	2	1	2	2	0	0	0	0	2	2	11
500– 999	3	3	1	1	0	2	0	0	3	2	15
1,000–1,499	4	0	10	5	0	1	2	0	1	11	34
1,500–1,999	5	3	7	3	0	0	1	3	8	15	45
2,000–2,499	3	9	4	0	2	2	4	3	8	11	46
2,500–2,999	6	6	1	5	3	1	2	5	15	16	60
3,000–3,999	2	10	5	15	1	3	4	4	26	30	100
4,000–4,999	9	5	7	6	5	4	6	4	24	23	93
5,000–7,499	4	7	17	8	3	2	6	6	47	39	139
7,500–9,999	3	1	3	5	2	3	6	4	27	16	70
10,000+	0	2	7	2	5	1	4	2	57	51	131
Unknown	0	1	0	1	0	0	5	2	10	8	27
Total	41	48	66	51	21	19	40	33	228	229	776
Recommended dietary allowances	2,000	2,500	3,500	4,500	5,000	5,000	6,000	5,000	5,000	5,000	
Number with less than recommended allowance	14	16	29	32	11	13	21	19	87	112	354
Percentage with less than recommended allowance	34.1	34.0	43.9	64.0	52.4	68.4	60.0	61.3	39.9	50.9	47.1
					Colored						
<500	4	1	5	5	1	0	0	1	3	8	28
500– 999	8	3	0	5	2	4	3	2	11	4	42
1,000–1,499	3	0	2	2	3	0	2	1	3	7	23
1,500–1,999	3	4	3	0	0	0	0	3	10	4	27
2,000–2,499	3	0	1	1	0	0	1	3	7	4	20
2,500–2,999	0	2	0	0	0	2	0	1	3	5	13
3,000–3,999	1	4	4	5	1	1	0	1	4	8	29
4,000–4,999	1	1	3	1	3	3	1	2	5	5	25
5,000–7,499	8	5	0	2	0	0	4	1	8	9	38
7,500–9,999	1	0	0	0	0	0	1	0	6	3	11
10,000+	1	3	8	10	4	4	9	8	35	36	118
Unknown	1	1	0	0	1	1	2	1	3	2	12
Total	34	24	26	31	15	15	22	24	98	96	365
Recommended dietary allowances	2,000	2,500	3,500	4,500	5,000	5,000	6,000	5,000	5,000	5,000	
Number with less than dietary allowance	18	8	13	18	10	10	8	14	46	45	190
Percentage with less than recommended dietary allowance	54.5	34.8	50.0	58.1	71.4	71.4	40.0	60.9	48.4	48.4	51.1

* Intake includes both vitamin A and carotene expressed as vitamin A. Recommended allowances for age and sex of Food and Nutrition Board, National Research Council. Twenty-five children under 1 year of age have been mitted.

† M = Male; F = Female.

in a 50 ml. pyrex centrifuge tube and allowed to clot. Blood drawn at the hospital was sent immediately to the laboratory, centrifuged, and the serum removed. When drawn in the field it was placed at once in iced containers where it kept during transport to the laboratory. With few exceptions the blood reached the laboratory within 4 hours.

RESULTS

Vitamin A Intake—Table 1 gives the average daily intake of vitamin A (carotene and vitamin A, expressed as vitamin A) with the number and per cent of those in each age, sex, and racial group with intakes falling below the recommended daily allowances of the Food and Nutrition Board.*

According to these standards the dietary intake was deficient (insufficient) in a large number, ranging from 34 per cent in the 1–3 age group to 68 per cent in the girls 13–15, among the white subjects, and from 35 per cent in children 4–6, to 71 per cent in boys and girls 13–15, in the colored. Although there is some difference in the frequency between white and colored subjects in some of the age and sex groups, this is probably not significant except in the children 1–3 and the boys 13–15 and 16–20. In the children 1–3, the greater frequency of the deficiency in the colored may reflect the lower intake of milk. The difference in the other two groups is unexplained.

History and Physical Examination—No subjects gave a history of any of the characteristic diseases of vitamin A deficiency such as xerosis, xerophthalmia, keratomalacia, or the dermatosis. Two hundred and four complained of one or more of such symptoms of pre-xerosis as dryness, burning, and sand in the eyes, photophobia, asthenopia, and conjunctivitis. Night blindness, generally considered a more specific symptom, was claimed by 60.

Symptoms of pre-xerosis were slightly more frequent in the colored than in the white subjects but much more striking differences were observed in some of the age and sex groups. In general the symptoms were much more frequent in adults (21 yrs.+), increasing from about 10 per cent in children, to 17 and 28 per cent in white, and 14 and 18 per cent in colored, men and women, but with a higher incidence in girls 13–15 and 16–20 which in colored girls amounted to 50 and 42 per cent. Night blindness occurred with equal frequency in white and colored, almost exclusively in adults and most often in white women.

Physical examination revealed no instances of well developed signs of vitamin A deficiency except for the dermatosis (eruption of the skin). Thirty-five subjects were found to have the characteristic dermatosis. Both the dry, horny, "goose flesh" type and the acneform type were observed. There were 12 instances of corneal scars which might possibly have been the result of lesions due to vitamin A deficiency in the past, and in 57 subjects changes were found in the sclera and conjunctiva which might be attributed to vitamin A deficiency. They consisted of the usual signs of conjunctivitis, redness and injection, sometimes dryness of the conjunctiva and such changes as a "muddy" and discolored (pigmented) sclera often with pingueculae or pterygia. Such changes are not very specific. The examination was made without reference to the findings, especially those detected with a slit lamp, described by Dr. Kruse, who had not yet published his observations.

The lesions in the eye, like the symptoms of pre-xerosis, and even night blindness, were by far the most frequent in adults. They were also found

* National Research Council

TABLE 2

*Distribution of Adaptometer Values Among Persons in the Survey According to Age, Sex and Race, Together With Number and Percentage With Values 4.0 or More**

Adaptometer Readings	*Age in Years*									
μμ Lamberts	*1–3*	*4–6*	*7–9*	*10–12*	*13–15*	*13–15*	*16–20*	*16–20*	*21+*	*21+*
	M-F†	*M-F*	*M-F*	*M-F*	*M*	*F*	*M*	*F*	*M*	*F*
					White					
<3.0	0	0	0	1	2	2	0	0	0	1
3.0–3.499	0	3	20	12	5	6	7	12	27	28
3.5–3.999	0	4	15	20	4	6	14	7	66	59
4.0–4.499	0	4	19	11	7	5	12	10	59	68
4.5–4.999	0	1	0	2	1	0	1	0	22	27
5.0–5.499	0	0	1	0	0	0	0	0	6	7
5.5–5.999	0	0	0	0	0	0	0	1	0	2
6.0–6.499	0	0	0	0	1	0	0	0	1	0
6.5–6.999	0	0	0	0	0	0	0	0	1	1
7.0 or more	0	0	0	0	0	0	0	0	2	1
Unknown	41	36	11	5	1	0	6	3	44	33
Total	41	48	66	51	21	19	40	33	228	229
Total tested	0	12	55	46	20	19	34	30	184	196
Number with 4.0 or more *μμ* Lamberts	0	5	20	13	9	5	13	11	91	108
Percentage with 4.0 or more *μμ* Lamberts	0	41.7	36.4	28.3	45.0	26.3	38.2	36.7	49.4	55.1
					Colored					
<3.0	0	0	0	0	0	0	0	0	0	0
3.0–3.499	0	0	10	10	3	7	5	5	16	16
3.5–3.999	0	1	3	10	3	3	8	7	27	16
4.0–4.499	0	3	3	9	5	4	4	9	26	34
4.5–4.999	0	0	3	2	1	1	2	3	16	9
5.0–5.499	0	0	0	0	0	0	0	0	1	4
5.5–5.999	0	0	0	0	0	0	0	0	0	1
6.0–6.499	0	0	0	0	0	0	0	0	1	3
6.5–6.999	0	0	0	0	0	0	0	0	3	0
7.0 or more	0	0	0	0	0	0	0	0	1	2
Unknown	34	20	7	0	1	0	3	0	7	11
Total	34	24	26	31	15	15	22	24	98	96
Total tested	0	4	19	31	12	15	19	24	91	85
Number with 4.0 or more *μμ* Lamberts	0	3	6	11	6	5	6	12	48	53
Percentage with 4.0 or more *μμ* Lamberts	0	75.0	31.6	35.5	50.0	33.3	31.6	50.0	52.7	62.4

* Twenty-five children under 1 year of age have been omitted.
† M = Male; F = Female.

about twice as often in men as in women and about twice as often in colored males (16 per cent) as in white males (8 per cent).

The dermatosis was found with equal frequency in the white and colored subjects but was practically limited to those past puberty. It was most common in the age group 16–20 and was found in one-fifth of the 40 white males of that age.

No significant association was found in the occurrence of the various symptoms and physical signs except that night blindness and the symptoms of pre-xerosis occurred together more frequently than either occurred in the total population. For example, night blindness was found in 16.7 per cent with symptoms of pre-xerosis but in only 5.5 per cent of the entire population. A vitamin A intake below the recom-

allowance was no more frequent in those with symptoms and physical signs of a deficiency than in those without.

Adaptometer—The results of the adaptometer tests are shown in Table 2 together with the percentage of those in the various age, sex, and racial groups showing an abnormal response. Among the entire group, nearly half (47 per cent) had an abnormal adaptation of vision to dark as measured by this test. The abnormality occurred most frequently in the adults, both white and

TABLE 3

*Distribution of Serum Vitamin A Concentration Among Persons in the Survey According to Color, Sex, and Race, With the Number and Percentage of Subjects With Concentration Below 70 International Units per 100 ml.**

	Age in Years										
	1-3	*4-6*	*7-9*	*10-12*	*13-15*	*13-15*	*16-20*	*16-20*	*21+*	*21+*	
	M-F†	*M-F*	*M-F*	*M-F*	*M*	*F*	*M*	*F*	*M*	*F*	*Total*
					White						
	2	2	2	0	0	1	0	0	0	3	10
	0	1	3	2	0	0	0	1	1	2	10
	2	3	4	2	0	0	2	1	1	3	18
	2	4	6	6	0	2	1	2	3	3	29
	3	7	4	1	1	2	1	1	7	13	40
	4	1	7	5	3	2	2	3	14	15	56
	0	1	2	6	1	2	3	0	8	15	38
	0	0	1	1	0	1	0	2	14	10	29
	1	0	2	2	2	1	3	2	27	22	62
	0	0	0	1	0	0	1	1	21	5	29
	0	0	0	0	0	0	0	0	3	3	6
	27	29	35	25	14	8	27	20	129	115	449
	41	48	66	51	21	19	40	33	228	229	776
	14	19	31	26	7	11	13	13	99	94	327
	9	17	19	11	1	5	4	5	12	24	107
	64.3	89.5	61.3	42.3	14.3	45.4	30.8	38.5	12.1	25.5	32.7
					Colored						
	0	0	0	0	0	1	0	0	0	0	1
	0	0	0	0	0	0	0	1	0	0	1
	0	0	1	1	0	0	0	0	1	0	3
	1	0	0	0	0	0	0	0	3	2	6
	3	1	0	0	0	0	0	0	1	2	7
	0	2	2	0	0	1	2	1	4	3	15
	1	1	1	2	0	0	0	2	3	1	11
	0	1	1	1	0	0	0	0	7	6	16
	1	1	5	6	4	5	4	1	9	9	44
	0	0	2	2	0	1	2	1	5	3	18
	0	0	0	0	0	0	0	0	1	0	1
	28	18	14	19	11	7	14	18	66	67	262
	34	24	26	31	15	15	22	24	98	96	385
	6	6	12	12	4	8	8	6	32	29	123
	4	1	1	1	0	1	0	1	4	5	18
	66.7	16.7	8.3	8.3	0	12.5	0	16.7	12.5	17.2	14.6

* Twenty-five children under 1 year of age have been omitted.
† M = Male; F = Female.

colored, and was slightly greater in the negroes and in the women. Among the children the groups with the highest incidence of poor adaptation were the white and colored boys 13–15 and the colored children 4–6. However, only 4 of the latter of these were tested and the number of white children 4–6 years who were tested was also very small. No positive relationship statistically significant was found between heightened threshold (poor adaptation) and night blindness, the symptoms of xerosis, or the dermatosis. Curiously there appears to be a significant correlation between the occurrence of an elevated threshold and changes in the sclera. In subjects with the latter an elevated threshold was found in only 28 per cent compared with 49 per cent in those without these changes. The percentage difference was 21 ± * 6.8.

Blood Vitamin A—The values for vitamin A concentration in the blood serum are given in Table 3 † together with the percentage of the subjects in the various age, sex, and racial groups with values below the lower limit of normal. Because the determination of vitamin A in the blood was not introduced until near the end of the first examination period, determinations were made in only 450 of the subjects, but the number in most of the groups is large enough to be significant. Among the white subjects the highest incidence of an abnormally low concentration is found in the younger children (1–12), though many of the girls 13–15 and 16–20 had low values in sharp contrast to boys of the same age. Boys 13–15, and men 21+ least often had a low vitamin A concentration. A striking finding is that greater frequency of low vitamin A values seem to be more frequent in the whites than in the negroes, the difference being considerable in all groups except the youngest children (1–3).

There appears to be no relation between low blood vitamin A concentration and the occurrence of night blindness, the symptoms of xerosis and the dermatosis. However, an intake of vitamin A below the recommended allowance was somewhat more frequent (68 per cent) in those with low blood vitamin A than in those with normal blood values (46 per cent), a difference of 22 per cent ±3.5. An apparently significant inverse correlation is found between low blood vitamin A values, physical changes in the sclera and high adaptometer values. Only 7 per cent of the 42 subjects with changes in the sclera who have blood vitamin A determinations had low blood A values, compared with 30 per cent for those without such eye changes, a percentage difference of 23 ± 7. Of the 95 with blood vitamin A below 70 I.U. only 17, or 18 per cent, had adaptometer readings above 4 micromicro lamberts, while 52 per cent of the group with normal blood vitamin A values had such adaptometer readings, a percentage difference of 34 ± 5.

DISCUSSION

There are three aspects of these results which are of particular interest and importance. They are: (1) the relatively large amount of vitamin A deficiency as indicated by the dietary intake records, the adaptometer test and the vitamin A level in the blood, (2) the relative scarcity of symptoms and physical signs of a deficiency, and (3) the lack of correlation between all these various measures of vitamin A nutrition.

According to the dietary records there was a deficient vitamin A intake in 48 per cent of the population as a whole and in a much larger proportion of certain groups, and, by that measure, a presumable vitamin A deficiency *state*

* Figures following ± sign refer to standard deviation of the difference.

† The values for carotene in the blood serum have been omitted to conserve space.

in a similar number. But, dietary intake as recorded here, and as a practicable procedure under similar circumstances, is not an accurate or reliable measure or test of the actual state of nutrition in respect to vitamin A. This is even more true of vitamin A than of some of the other nutritive factors because of the greater storage and reserve capacity in case of vitamin A. With this greater reserve the defects and errors inherent in a record of dietary intake over a necessarily limited period of time are exaggerated. The limitations of the dietary intake method are particularly great at the level of a slight deficiency, the indeterminate zone between no deficiency and some deficiency. Only in the more severe dietary failures, and in monotonous diets of limited variety and fixed quantity do intake records reach any considerable degree of reliability in the *assessment* of individual nutrition.

A second factor which must be taken into account in the interpretation of the results is the standards which are used. Those of the Recommended Allowances, while probably desirable to foster a liberal intake of an important nutrient, may be higher than are needed to protect against a true physiologic deficiency as recognizable today. Use of such standards increases the apparent deficiency indicated by the dietary intake.

The measurement of the rod threshold for light perception as a test of vitamin A deficiency is similarly open to criticism, not only of its accuracy but of its specificity. Measurable impairment of dark adaptation undoubtedly occurs in vitamin A deficiency but a variety of errors, mainly subjective, cause some unreliability, particularly at the level of slight impairment, and there are other causes of impaired dark adaptation than vitamin A deficiency. Some of these sources of error are particularly operative in the mass examination of populations and are of less importance in tests of individual patients. The opportunity to make repeated and more complete tests, to search for evidence of other disease, and to use the therapeutic test enhance greatly the reliability of the adaptometer test in clinical practice.

Just how reliable test is under the conditions of this survey is uncertain. In such a general population, error from such causes as retinitis pigmentosa, which is very rare, and anoxia in the usual sense must be very small, particularly because the complete history and physical examination helped greatly to exclude such causes. However, we have observed in other studies a distinct tendency to elevation of the rod threshold with advancing age. Examination of the data under consideration shows a direct relation between increasing age and the proportion of those with an elevated threshold, the latter rising very sharply to over 70 per cent in those beyond 40 years of age. Furthermore, thresholds of 5 micromicro lamberts or over were more than 12 times more frequent in persons over 40 than in the younger subjects. Experience under comparable conditions and with a similar group of people in whom the effect of administering vitamin A under adequately controlled conditions was studied suggests that in about 50 per cent of the cases the finding of an elevated threshold by this technic represents a vitamin A deficiency or an elevation which can be reduced by the administration of vitamin A (cod liver oil). Finally it should be pointed out that the instrument allows a very delicate measurement of light perception, that at the levels of the slightest or earliest deficiencies the subjective error of the subject's response may exceed the instrumental error, and hence slight variations from the accepted normal are of little significance, at least under the conditions of such a survey as this.

Fewer objections can be made to the concentration of vitamin A in the blood plasma or serum as an index of vitamin A nutrition. Conditions other than a deficiency of vitamin A may at times affect the level of vitamin A in the blood but in most population groups they are an insignificant factor. (In individual patients such cases are ordinarily revealed by the examination.) Temporary variations may be caused by fluctuations in recent intake and the use of blood analysis as a test of vitamin A deficiency has been objected to on these grounds. However, falsely high values, not representative of the general body store and state of nutrition, are unlikely in a deficiency unless there has been recent ingestion of exceptionally large amounts, a fact which can be ascertained from the history. On the other hand it has been quite clearly shown that individuals with normal stores when placed on a reduced intake do not suffer from a reduction in the concentration in the blood for long periods, until, indeed, an actual deficiency of at least the reserve store develops.[6] Consequently, deprivation for short periods is unlikely to cause a false low value in individuals actually in normal nutrition, i.e., unless there actually exists a deficient reserve.

Assuming that the concentration of vitamin A in the blood reflects the general level of vitamin A and the reserve stores in the body and that under the conditions of such a survey as this it is not unduly influenced by extraneous factors and temporary fluctuations in vitamin A intake, the significance of an abnormally low concentration as an index of vitamin A deficiency may still be a matter of dispute. Actually it depends on the definition of vitamin A deficiency. If by vitamin A deficiency is meant the presence of demonstrable signs of disturbed function or structure, a low blood vitamin A is not a reliable sign of deficiency. Low concentration of vitamin A in the blood is found without evidence of disturbed function or structure, and the latter are observed without low vitamin A of the blood because the latter responds more quickly to increased intake of the vitamin. In view, however, of the inability to detect the earliest disturbances in function and structure, or to determine at what level of reduced blood or body content and store they first appear, the concentration of vitamin A in the blood may be used as an index of vitamin A nutrition and a concentration below the generally established "normal value" may be taken as evidence of a deficiency. Certainly the lack of an adequate and usual store or reserve, which under usual or "normal" circumstances protects against actual deficiency during periods of temporary shortage of supply or increased demand, can be taken, especially for public health purposes, as an abnormal state and a deficiency in a practical sense.

In contrast to the relatively frequent state of vitamin A deficiency disclosed by the diet record, the adaptometer readings and the blood vitamin A tests, the amount of deficiency revealed by history and physical examination was surprisingly meager. The greater number with *symptoms* is probably a reflection of the lesser reliability or specificity of these manifestations. Although many of the complaints of dryness of the eyes, burning, asthenopia, etc., may have been the result of mild vitamin A deficiency there is absolutely no means of distinguishing such cases with certainty from similar symptoms with other causes. Furthermore, a lack of correlation between the symptoms and physical signs and such evidences of deficiency as the dietary intake and laboratory tests cannot be taken as an indication of the reliability of those symptoms and signs for reasons to be discussed below. It may be observed however that these remarks apply only

when the signs and symptoms are an expression of mild deficiencies. Night blindness for example is probably a highly reliable symptom when it is severe.

Objective physical evidence of a deficiency was even less frequent than symptoms, as is to be expected, but, at least in respect to the dermatosis, is more reliable. Doubt of the value of the dermatosis as a sign of vitamin A deficiency has been expressed but without sufficient consideration of the factors involved in the diagnosis and interpretation of the lesions. Highly nonspecific changes such as "dryness," "roughness," and "redness" have been given undue weight. Though frequently found with the characteristic eruption they are only a few among several changes and of little value in themselves. As do other characteristic eruptions, the dermatosis of vitamin A deficiency has features of location, distribution, pattern, size, color, shape, and consistency of the individual lesions which distinguish it from other eruptions. The hyperkeratotic follicle is one of the individual lesions of the vitamin A deficiency dermatosis but a hyperkeratotic follicle, or several of them, is not *the* dermatosis. It is true that at best the dermatosis is not pathognomonic. It is however a sign of considerable reliability and meaning when properly identified. Unfortunately, under the condition of the examination used in this survey the results of the examination of the conjunctivae cannot be so definitely evaluated.

The third feature of particular interest in the results is the lack of correlation and agreement between the various indices or evidences of vitamin A deficiency. Such a lack of agreement might be thought to indicate such a lack of reliability of one or more of the procedures, tests or signs as to impair the value of the survey. Yet, consideration will show, as already stated, that such agreement need not necessarily be found or expected. The intake of vitamin A may fail to accord with the concentration in the blood because there has not been time for the latter to reflect recent changes in intake, particularly when the fluctuations in intake are not greatly above or below the minimum requirements. Only in respect to the rod threshold (adaptometer) might close correspondence be expected with the intake of vitamin A (elevated thresholds may respond promptly to increased intake of vitamin A), but even then good correlation might be obscured by relatively slight changes in vitamin A intake and the effect of subjective error on the detection of slight changes in the threshold. Finally, there is the possibility, for which some evidence is accumulating, that other variables than those previously known or suspected are concerned, in addition to vitamin A, in visual adaptation to the dark (adaptometer).

Correspondence between the symptoms and the physical changes and the intake of vitamin A, the blood concentration of vitamin A, or the adaptometer value is even more unlikely. The symptoms (except night blindness) and physical changes are slow to develop and slow to disappear, requiring weeks or even months and hence often lagging far behind changes in the other indices.

It is necessary therefore, to take these various manifestations, the symptoms, the physical changes, and the laboratory tests as independent signs of a deficiency, differing in their reliability and specificity. Also they have a differing quantitative significance, reflecting variations in the severity and to some extent in the chronicity or duration of the deficiency.

SUMMARY

On the basis of this discussion the

nutrition of the population as respects vitamin A may be summarized as follows: There was a deficient dietary intake of the vitamin in a large proportion of the population according to the standards of sufficiency adopted. This deficiency of intake was not accompanied by a correspondingly high incidence of symptoms or physical signs of a deficiency, only a relatively small number of the subjects exhibiting this evidence of a deficiency. On the contrary, the test of dark adaptation and the concentration of vitamin A in the blood indicated a degree of deficiency somewhat comparable to that suggested by the dietary intake. Reasons are given why test of dark adaptation may not be a reliable measure of vitamin A deficiency, but the concentration of vitamin A in the blood is believed to be a significant index of vitamin A nutrition. It should be emphasized that the manifestations of a deficiency vary at different levels of intensity and duration and according to the definitions of the deficiency.

Neither the deficiency of intake nor the objective manifestations of a deficient nutrition were distributed equally among the various age and sex and racial groups. While the explanation for some of these differences seems quite clear, others are at present unexplained.

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Wartime Problems of a County Health Officer*

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SOME of my wartime problems arise from within my department. Others press on it from without. First, of the inside problems, there is the heavy loss of personnel—to the armed forces, to high salaried jobs in war industry, to better paid employment in other governmental organizations, and, in the case of many of the former women employees of the department, to an easier life at home, where the income of the husband is now enough to make it no longer necessary for the wife to work. Second, for those who stay by the department, most of whom are older and less energetic to begin with than those who have left it, there is the discouraging effect of their low salaries in the face of high living costs, also the general feeling of uncertainty which nobody seems able to overcome, depressing their morale. Third, there is the insistence of some of my ambitious fellow workers that the department adopt new policies and move into new fields whenever anything opens the way.

First, of the outside problems, there are the new projects that certain popularity-hungry people think up and shout about, then look around for some "George," too frequently the health department, upon whom they can throw the burden of doing the work. Second, there are the official visitors who call to find out what we are doing and how we are doing it, and then suggest that we stop doing this or start doing that or change our ways to conform to this or that model, etc. Third, there is the slowness with which tax-supplied funds grow, and the equal slowness with which some of those who control the funds seem to grasp the fact that now is the time when the health department ought to be able to meet new and increasing needs with augmented strength. Lastly—at least the last that I shall mention—there is the public, more upset and more fearful about almost everything now than ever before, and more often and more insistently than ever demanding that the health department "do something about it."

It is unnecessary to discuss in detail all of the problems I have mentioned. In some cases, little more than the brief statement already given is needed to make them clearly understood. In others, it seems best to explain further and to give some examples, duplicates of which, I feel sure, can be supplied from other jurisdictions.

When it comes to fellow workers leaving the department, what else can one do than give his best regards and good wishes to those who join the armed forces? And those who leave to take up high salaried jobs in war industry can hardly be blamed. As to those who go to better paid employment in other governmental organizations, I feel impelled to hold them up to the men who handle the county money bags as an argument for raising salaries. I can hardly expect them to compete with our state at present, because the California treasury has more loose money in it now than at any pre-

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vious time in my recollection. But I look at Los Angeles City, our big neighbor, which has a hard time to find money enough to put concrete patches on an old sewer outfall down in the surf and keep it in operation for a while longer, to say nothing of being able to finance an adequate sewage treatment plant and free those ten miles of our beautiful beaches from quarantine; and I complain loudly: "Why should we pay our nurses less than the City Health Department pays?"

Now, what of those who stay by the department? While there does not seem to be much change possible in the general low salary level in local government, and there is little that can be done to relieve the feeling of uncertainty about what lies ahead, these conditions do present a challenge to me, and, I believe, to the head of any department of local government.

We must support morale by being as sympathetic and human in dealing with our fellow workers as it is possible to be. This is no time for a county health officer to put on the high hat or to tighten the thumb screws.

I can appreciate the attitude of my ambitious associates who see what they consider opportunities for the department to spread out into broader fields. They believe that if we do not occupy these opening fields, somebody else will; and then later we may find our own work disappointingly small and circumscribed. For instance, a year or so ago there was an increasing demand for part-time bedside nursing care in many of our communities. Some of our leading nurses felt strongly that we should begin a bedside nursing service, lest the newly-born Visiting Nurse Association undertake the work and earn the good will that they thought ought to be ours. I did not think we had force enough to attempt it then; and now, with a force of nurses so greatly depleted that we are not even able to maintain the services which we have for many years considered essential, we certainly would find ourselves in a very embarrassing position if we had led the public to believe that we could take on the bedside nursing burden too. It is all right to grow, but not so good to swell.

I wish there were time for a more extended discussion of the merits and demerits of my department's entering further into the field of giving medical care to the people. With regard to what may be done to promote positive health through education about nutrition and desirable health habits, I do not hesitate to urge my department staff to go the limit. And I do not consider myself out of place in promoting general knowledge about common illnesses and simple home treatments for them. In these respects many of our citizens are not as far ahead as their grandmothers were, and I think public health people are elected to help win back the ground lost on this front and to make still further advances. That, admittedly, is only the fringe of medical care.

I know that many believe the time will eventually come, and perhaps in the not-too-distant future, when the medical care of a considerable proportion of our citizens will be given, or at least organized and supervised, by health departments. I confess to being somewhat slow in moving very far in this direction. In my county, the medical care of the indigent is already set up under the Charities Department, and no department likes to diminish its importance by turning over any considerable part of its established activities to another department. Furthermore, we have the California Physicians' Service and the Group Hospital Plan in operation, and I think these organizations should be given a fair chance to show what they can do. Fundamentally, of course, it is up to the

people to say what kind of medical care they want, who shall give it, organize it, or supervise it, and how it shall be paid for. It is possible that some day organized medical care under government auspices will come into general being, and that by public demand health department doctors will have to take a leading part in it. If that day comes, I of course want to be ready for it.

It is, for this and other reasons, one of my most vital problems as a county health officer to keep in touch with the current of public opinion in my territory, so that I can not only know what is needed and wanted from day to day, but can foresee trends and tendencies to some extent. I should even, within reason, try to mold public opinion; but I should not walk too far in advance of my public. A drum major is an inspiring sight and serves a good purpose marching in front of his band; but he would look silly and be useless prancing up the street two or three blocks ahead.

When it comes to outside problems, I know of no way of heading off people who want to be looked at as saviors of their community in this "time of peril," but who also prefer to have somebody else do the work which their bright ideas make necessary. I shall never forget a remark made by the elderly watchman of the parking lot beside our office building, apropos of local activities, mostly talk, in the early months after Pearl Harbor. He said, "Well, Doc, the trouble with this here business is that there is just too many guys that want to be heroes." It is not always easy for a county health officer to save time enough to attend to his own business in the midst of such conditions without seeming to be uncooperative or even an unpatriotic obstructionist.

I am happy to say that our official visitors, who sometimes come in the flesh and sometimes in the form of pamphlets with imposing titles, and who months or years ago were inclined to be critical of what we were doing and how we were doing it, have more and more come to see that communities differ, and that each one must settle its questions and do its work more or less in its own way if it is to be done to the best advantage.

One lasting memory, however, is the way that pressure was applied to my illustrious predecessor to recruit a large force of volunteer sanitary inspectors, the estimated needs running all the way from ten to forty for each of our twelve districts. Under this pressure, an earnest effort was made to find volunteers for such work. We finally succeeded in bringing a few small groups together here and there, but when we started to train them they began to evaporate. Within a few months there was hardly one left. Nobody is trying to tell me now that this plan will work in Los Angeles County.

During the early weeks of my own administration, I was plagued with the proposal that all of my regular inspectors be provided with emergency driving permits and blackout driving lights. They were also to be organized so that they could rush out into the field in case of a bombing raid to take care of food, water, and sewage problems caused by the explosions. Of course I wanted them ready when the raid was over and daylight came to take care of all emergencies that properly fell to them; but just what they would be able to do in the dark with food stocks and water and sewage systems, and with air raid wardens, policemen, firemen, utilities crews, emergency medical squads, etc., swarming around, I was never able to see. Still, I did not know for a while whether or not I could dodge this ill-timed activity without being looked at as next door to a traitor.

As to the county officials who have to estimate the distance to the bottom

of the tax barrel in deciding how much support will be given to the health department, I sympathize with them. They cannot, in many instances, do what they want to do. But they always have *some* leeway, and it is my problem to guess how much time and pressure I should employ in keeping them informed about the changing public health needs of the people, the effect of wartime conditions on our working staff, and how much, under the circumstances, I think they ought to do about these things. If I put on too little pressure, I fail to do my duty. If I put on too much, I succeed only in making myself a nuisance.

Now let us give attention to a perplexed and apprehensive citizenry. I have lost all hope of keeping up with their multiplied appeals, yet must daily take care that I do not become callous to them. The wife of a defense plant swing shifter wants me to keep neighbor A's roosters from crowing and neighbor B's pup from barking, so her husband can sleep. One dog lover wants me to sponsor an ordinance that will insure a type of inspection of animals slaughtered for pet food as good as that which is available in packing houses producing meat for human consumption; for, you see, wartime conditions have resulted in a poorer quality of dog food on the market.

One wants me to make the organization of sanitation districts my immediate purpose and chief aim in life. Every few days he comes in and repeats his arguments: Will not the lack of sewers breed filth? Will not filth breed epidemics? Will not epidemics ruin the country that the boys on Guadalcanal are dying to save? Another wants me to rid his chicken farm of rats. Are not rats a plague menace?

Dozens—one or more almost every day in the summer months—insist that I do something about the mosquito pest. It is hard to describe the feeling of weariness and frustration that results from having to explain over and over during the mosquito season that, in California, state laws specify that mosquito control shall be carried on under the Mosquito Abatement District plan, and that the health department cannot legally spend money on it, especially when one knows that many of the complainants suspect the explanation is only a "brush off." To get around this point, one citizen insists that the mosquitoes in and around his home are the kind that can carry malaria, therefore I should exterminate them as a means of preventing the spread of communicable disease. When several of them are caught, and identified by the best authority in the West as not being anopheline at all, let alone being malaria vectors, he does not act as if he is yet convinced; and I have no doubt that he thinks, and perhaps tells his neighbors, that the health officer is neglecting his duty.

Then there is the poor lady, sensitive to oleander blossom pollen, who thinks the bulk of disease in many parts of the county is due to oleander poisoning. She asks me if it is not as important to head up a campaign to destroy all the oleander bushes in the county as it is to be concerned about the increasing prevalence of rabies.

But time makes me put a stop to this account, though there is no end to the story. I have to confess to being a poor drum major, with a band that I can seldom keep either in step, in time, or in tune. Still I resolve to trudge persistently along waving my health baton, with both ears and one eye on the band to keep it in plain sight and hearing, and the other eye on the road ahead. Without that forward look, both the band and I would probably fail to make the right turns when the time came, and eventually find ourselves lost in some pseudo health street with a dead end.

Procurement and Assignment—The Industrial Hygiene Problem*

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WHEN the United States entered the war there was a bank of some 300 trained industrial hygiene personnel, exclusive of physicians. Many of these have been absorbed by the military forces, the U. S. Public Health Service, the Maritime Commission, and other federal agencies, as well as by state and local bureaus of industrial hygiene. These agencies are not at present recruiting industrial hygiene personnel. However, should they need any, applicants will be cleared through the Procurement and Assignment Service for Sanitary Engineers of the War Manpower Commission.

This service is now operating under a definition of essentiality which is designed to assure state and local industrial hygiene agencies one industrial hygiene engineer for less than 500,000 of labor population, two for 500,000, and one more for each additional 500,000. This may or may not assure a sufficiency of service. Regardless of that, the pressing problem of the war industries, in so far as industrial hygiene is concerned, is not in the official agencies and in the services that they can render but in the industries themselves.

Prior to the war there were not too many in-the-plant industrial hygiene engineers. The expansion in personnel had occurred mostly in the state and local official agencies and this was stepped up greatly by the declaration of war. When industry sought to employ them, trained and experienced persons were not available. A training program was attempted but it failed to progress much beyond that which was developed by the Division of Industrial Hygiene of the National Institute of Health, which did not increase the availables for industry.

So, except for the services supplied by the official agencies, the industrial hygiene activities of industry have been, with some few exceptions, and will be, definitely curtailed for the duration. The help of the official agencies is valuable and, of course, it is appreciated. But limited in personnel as they are by the definition of essentiality, their services to industry must necessarily also be limited—exceedingly so. These agencies cannot give day to day service, nor can they follow through. They can make surveys and they can counsel with industry; but the war industries need more than that to maintain control over exposures.

Concurrently with these developments have come further changes and additions in occupational disease laws, making them more stringent and inclusive. Industry has attempted to meet the situation after a fashion. Plant physicians, nurses, chemists, and safety men have picked up practical information with respect to certain exposures peculiar to their plants and with the aid of official agencies they have done quite well. The safety people have been especially interested and active

* Presented before the Industrial Hygiene Section of the American Public Health Association at the Seventy-second Annual Meeting in New York, N. Y., October 14, 1943.

and they have done very well indeed, particularly in the prevention and control of air contamination.

In view of the foregoing, the Michigan Industrial Hygiene Association has deemed it wise to encourage and improve this lay assistance, and in doing so, special consideration is now being given to safety personnel. The most notable effort in this direction is now being projected at the request of the Industrial Hygiene Association by the School of Public Health of the University of Michigan. The first move is an "In-Service Training Course in Industrial Hygiene for Plant Safety Personnel" at Ann Arbor, during October, 1943. There appears to be a sufficiency of importance in the course to warrant a rather complete description.

It is planned to be a course of instruction, not a convention or a conference. A special faculty group is brought together for the occasion, composed of speakers who are recognized authorities. Each has been chosen for his familiarity with certain industrial problems, his contacts with plant safety personnel, and his capacity for practical application of technical information, as well as knowledge of the subject he will discuss. While the course will consist of a series of lectures by different speakers, it will provide continuity of instruction, with special bearing on environmental control procedures concerned with the prevention of occupational diseases and their implementation by safety people.

Although the course is for safety personnel, some physicians have registered and will be in attendance. However, there will be no discussion of industrial medical, nursing, and accident prevention procedures. If there seems to be a demand for this type of instruction, and there appears to be already, it will be handled in subsequent courses.

Supplementing the lectures there will be a group of informative educational exhibits on: (1) Protective clothing; goggles, respirators, and other commonly used protective devices. (2) The instruments and equipment used by industrial hygiene engineers in making environmental surveys. (3) Simple, but effective, home-made goggle-cleansing, and boot and glove-cleansing stations used in certain plants.

The subjects to be discussed are:

Significance of Industrial Hygiene
Relationship of the Safety Engineer to Industrial Hygiene
Environmental Aspects of Industrial Hygiene
Control of Solvent Vapors and Acid Mists
Control of Smokes, Fumes and Gases
Evaluation and Control of Dust
Safe Operation of Solvent Degreasers
Foundry and Forging Practices, Moulding, Core Making, Shake-out, Cleaning, Heat Treating, etc.
Metal Finishing, Machining, Grinding, Welding, Plating Metal Cleaning and Painting, etc.
Plastics, Formaldehyde, Resins, Impregnation, Curing Fabrication, etc.
Industrial Ventilation Practices
Applications and Limitations of Respiratory Protective Equipment
Personal Protective Clothing and Equipment
Causative Agents of Industrial Dermatitis
Dermatitis Preventive Measures
Modelling of Women's Protective Clothing
Legal Interpretation of the Recent Modifications of the Michigan Workmen's Compensation Act
Plant Sanitation
Maintenance and Its Relation to Safety and Health
How to Make a Survey for Health Hazards
How to Sell Industrial Hygiene to the Worker
How to Utilize the Resources of Official and Private Industrial Hygiene Agencies

SUMMARY

The industrial hygiene problems of Procurement and Assignment are now limited largely to industrial plants. New well trained personnel are not available. Industry is temporizing with lay assistants and thinly spread help from the official agencies. Safety personnel have become interested and are doing very well. A special course for their instruction has been discussed.

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DDT

ONE of the gravest health problems which will confront our Armies of Occupation in Europe (a problem already encountered in the Naples area) is the threat of typhus fever. The dislocation of populations, the lack of soap and of fuel for heating water, and the contributory influence of malnutrition will certainly confront us with the same situations which arose in the retreat of Napoleon's armies from Moscow and in the years of the Russian Revolution and the mass migrations which followed the First World War.

Fortunately we have at our disposal new control methods which are infinitely more powerful than those we possessed a quarter of a century ago, in the cumbersome procedures of heat disinfection (the Serbian barrel, for example) or the mass treatment of clothing by gaseous disinfectants.

Early in 1941, the Preventive Medicine Service of the Surgeon General's Office of our Army began an intensive study of insecticides and insect repellents; the exhaustive investigations made in the last two years have indicated the remarkable potency of dichloro-diphenyl-trichloroethane (DDT). This substance, synthesized by a German chemist in 1874, was suggested by a Swiss chemical firm in 1939 as an insecticide to be used against moths and plant lice. In May, 1943, DDT was adopted by the Army as the standard louse powder. One application of this powder is effective for 3 to 4 weeks, unless the powder is removed by washing. It can be applied by hand and power dusters without removal of the clothing. It is also possible to impregnate underwear with DDT; and in preliminary tests such underwear has retained its effective power for 7 to 8 weeks, even though washed once a week during that time.

All available DDT is now needed by the armed forces and present production is only sufficient to permit its use as a louse powder.

The efficiency of DDT in combating mite-borne typhus (scrub fever and the like) has not yet been revealed. So far as the classical European typhus is concerned, however, it seems that a phenomenally efficient control procedure is now available.

STREPTOCOCCOSIS

ONE of the most interesting developments of modern medicine is a recognition of the difference between a pathological classification of disease on the one hand and an epidemiological classification on the other. The same germ may produce two quite different clinical disease entities; and the same disease may be caused by quite different etiological agents.

Such a situation has been revealed by recent studies of diseases caused by the hemolytic streptococci. It has been shown that such diverse pathological conditions as scarlet fever, erysipelas, tonsillitis, cervical adenitis and otitis media may be caused by identical or closely related organisms [1]; and Sidney Sinclair has suggested the term "streptococcosis" as a useful designation for the entire etiological group.

To avoid a tendency to undue simplification, it should be remembered that other investigators have recorded notable differences between individual streptococcal types in their tendency to produce a particular clinical picture. In a Naval Training Station, it was shown that Types 1 and 6 are generally associated with pharyngitis and tonsillitis, Types 3 and 19, with scarlet fever.[2]

Nevertheless, it is clear that a single type of streptococcus may—at the same time and in the same family—produce diseases as diverse as scarlet fever, sore throat, erysipelas, and otitis media. Such a situation offers a direct challenge to our conventional practices of isolation and quarantine. A more or less typical state sanitary code provides that scarlet fever shall be isolated for at least 21 days from onset and streptococcus sore throat only during the clinical course of the disease; while erysipelas and otitis media are not mentioned at all. Even our Committee on the Control of Communicable Diseases calls for the isolation of scarlet fever for 21 days "if medical inspection is not available" and for quarantine of exposed children and teachers from association with children and food handlers from their work until 7 days after exposure; while, in the case of septic sore throat, isolation is during the clinical course of disease and convalescence and no quarantine is called for.

It seems somewhat fantastic that of three people in the same family, all infected with the same etiological agent and all equally able to disseminate that agent, one (with a rash) should be isolated for 21 days, one (with a sore throat) during illness, and the third (with a discharging ear) not at all.

The problem is clearly a difficult one. The diagnosis of "scarlet fever" must clearly be maintained for comparability with past statistics, however much or little it means from an epidemiological standpoint. The term "septic sore throat" in our lists of reportable diseases can easily be broadened by adding the words "and other diseases of the upper respiratory tract caused by hemolytic streptococci." Should other forms of streptococcosis also be included in our regulations for isolation and quarantine? Should the isolation period for scarlet fever—as well as for its allied diseases—be based on the disappearance of the causative organisms rather than on an arbitrary time limitation? Are not our present procedures too harsh in the presence of a rash and too lax in its absence?

It seems clear that this subject offers one of the most important challenges to the public health administrator of the future. Streptococcal infections probably rank next after tuberculosis, influenza, pneumonia, syphilis, and "the common cold" in the order of importance of current communicable diseases in temperate climates and in areas of relatively high economic status. We need more intensive

typing studies such as those of Schwentker and his associates; we need expansion of public health laboratory services for the diagnosis and release of streptococcal infections; and we need open-mindedness on the part of administrative and code-making bodies, with a readiness to modify the standard procedures of the past in the light of the new knowledge of the future.

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FRIENDS OF THE SLUM

IT has often been pointed out that the social issues involved in our future public health program are more controversial than the earlier problems which related to the control of microbic diseases. "The diphtheria germ has no friends; but the insanitary tenement has powerful allies." The friends of the slum have rallied to its defense during the past year.

The Second Realtors War Conference, the National Association of Real Estate Boards, the National Association of Home Builders, and the United States Savings and Loan League have joined in a concerted attack on public housing which has found its first concrete expression in an organized and heavily financed attack on the National Capital Housing Authority of Washington, D. C.—an assault which has been frankly described as a "pattern" for similar onslaughts on the housing movement throughout the nation. The announced platform of this group is that public housing has been a failure, that no more public housing should be undertaken, and that the housing now controlled by local or federal governmental agencies should be turned over to private enterprise. These champions of the principle of individual initiative are quite willing to have the government buy up the slums at their present inflated values, provided that the land is then turned back to private enterprise. They propose that the needs of the lower income groups be met by means of "rent certificates" issued to individual families through local welfare departments. They state that such certificates must not be used to perpetuate slum conditions; but they do not indicate how such a desirable result can be attained under the plan proposed.

The misrepresentations and fallacies involved in this attack on public housing have been fully and convincingly exposed in Nathan Straus' *Seven Myths of Housing*, reviewed in this issue of the JOURNAL. The strange feature of the situation is that the thinking of this pressure group—presumably representing the considered judgment of business men—moves in a field of sentimental and emotional abstraction and ignores the practical economic facts of the situation.

These facts may be summarized in the form of two main conclusions, both amply verified by economic theory and practical experience. The first of these conclusions is: that no social purpose can be attained by clearing present slums unless and until some other more adequate homes are provided for the present slum dwellers. The health officer knows well that if all the substandard dwellings in a given community were suddenly eliminated, a considerable section of the population would be sleeping in the streets. Therefore, the provision of good homes must go forward hand in hand with the demolition of bad homes.

Second: that the provision of adequate dwellings for the lower income group can only be accomplished by governmental construction of such dwellings for

rental at a figure which the prospective occupants can pay. A substantial proportion of the population—even in 1929, the peak year of peacetime prosperity—had family incomes too low to permit the payment of an economic rent for decent dwelling facilities. Obviously private capital, which rightly and properly operates for a profit, cannot serve this group. Only the people as a whole—actuated by the conviction that decent homes form an essential factor in good citizenship—can fill the gap. It has begun to fill it successfully and economically under the Federal Housing Act of 1937.

The tragic part of this whole controversy is that there is really no conflict at all between public and private housing. Public housing recognizes that at least two-thirds of the homes of the future must and should be built by private capital and that this area of business initiative should be broadened as far as possible by application of new building technologies and sound modern methods of financing. Public housing begins only at the point where private housing is unable to meet our needs.

It is quite possible that the well financed propaganda of the special-interest groups mentioned above will gain local and temporary successes. Of the ultimate triumph of the public housing program we can rest assured. The American people have common sense enough to see that the public purchase and clearing of slum areas, without the provision of adequate housing for the lower income group, can have no effect except to assure speculative real estate owners of profit on swollen urban land values; and that the "rent certificate" can only (as in the past experience of welfare allowances for rent) continue to perpetuate slum conditions; or else provide government grants so large as to cover not only basic costs but also a margin of profit to the entrepreneur; or more probably both. The opponents of public housing object to "concealed subsidies"; but, in effect, they propose new and vast concealed subsidies—to be paid—not to the low-income families who need and deserve aid—but to private real estate interests which are supposed to function on the basis of free competition.

We believe that the vast majority of our fellow-citizens engaged in real estate and allied financial businesses believe in free competition and desire no government aid in the field in which business initiative can function; and that they also recognize the need for government action in the interest of American equality of housing opportunity for the children of those whose economic status does not furnish the possibility of legitimate private profit. They are sadly misrepresented by those of their leaders who are engaged in an attempt to block the progress of a sound and essential public movement and to secure from the public treasury special advantages for the same minorities which have created our present slums and now desire to perpetuate them and recreate them as sources of exploitation.

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Studies on the Toxicity of Dyes for Bacteria—Cassandra Ritter, Water Laboratory, University of Kansas, Lawrence, Kans.

Tuberculosis and the Tubercle Bacillus—M. H. Brown, M.D., University of Toronto, Toronto, Ont.

Typhus Fever and Laboratory Methods for Its Recognition—Ida A. Bengtson, Ph.D., National Institute of Health, Bethesda, Md.

Whooping Cough and B. Pertussis—George McL. Lawson, M.D., Box 1113, Charlottesville, Va., and John J. Miller, Jr., M.D. (Lieutenant Commander), Naval Base, Navy 717, c/o Fleet P.O., San Francisco, Calif.

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Coliform Group Variants—Leland W. Parr, Ph.D., George Washington University, Washington, D. C.

Methods for the Determination of Iodine—John T. Tripp, Ph.D., Army Medical Center, Washington, D. C.

Microscopic Methods of Water—Theodore A. Olson, 2724 Redick, Omaha, Nebr.

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Committee on Membership

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Representatives of the American Public Health Association to Other Organizations and Committees for 1944

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American Association for the Advancement of Science
Reginald M. Atwater, M.D.
Abel Wolman, Dr.Eng.

American Committee on Maternal Welfare
Thomas Parran, M.D.

American Documentation Association (1943–1946)
Halbert L. Dunn, M.D.

American Hospital Association (liaison representative)
Charles F. Wilinsky, M.D.

American Society of Civil Engineers and Federation of Sewage Works Associations—Joint Committee for Revision of the Report on Definition of Terms Used in Sewerage and Sewage Disposal Practice
Gordon M. Fair
H. A. Whittaker

American Society for Testing Materials—Committee on Soap
Carl R. Fellers, Ph.D.

American Standards Association
Building Code Correlating Committee (1943–1945)
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W. Scott Johnson, alternate

Letter Symbols and Abbreviations for Science and Engineering
Earle B. Phelps

Safety Code for Dry Cleaning Establishlishments
H. H. Schrenk, Ph.D.
H. G. Dyktor, alternate

Safety Code for Exhaust Systems
Henry Field Smyth, M.D.

Sectional Committee on Allowable Concentrations of Toxic Dusts and Gases
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Sectional Committee on Bedding and Upholstery—Subcommittee on Sterilization
F. J. Maier

Sectional Committee on Building Code Requirements for Light and Ventilation
Rollo H. Britten
C.-E. A. Winslow, Dr.P.H.

Sectional Committee on Minimum Requirements for Plumbing and Standardization of Plumbing Equipment, A-40 and Subcommittee No. 1

M. Warren Cowles
Sol Pincus, C.E.

Sectional Committee on School Lighting

Leonard Greenburg, M.D.
Joel I. Connolly, alternate

Sectional Committee on the Safety Code for Industrial Sanitation in Manufacturing Establishments

Leonard Greenburg, M.D.
Kenneth E. Markuson, M.D., alternate

Ventilation Code

Earle B. Phelps

Commission for the Study of Biological Stains

William D. Stovall, M.D.

Joint Committee on Definition of Terms Used in Water Works Practice (Joint with the American Society of Civil Engineers and the American Water Works Association)

Earle B. Phelps, *Chairman*
Sol Pincus, C.E.
Ralph E. Tarbett, C.E.

National Conference for Coöperation in School Health Education

Ira V. Hiscock, Sc.D.

National Council on Rehabilitation

Don W. Gudakunst, M.D.

National Conference on Uniform Traffic Accident Statistics

Robert J. Vane

National Health Council

Reginald M. Atwater, M.D.
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National Nutrition Advisory Committee

Robert H. Riley, M.D.

National Safety Council—Home Safety Advisory Committee

Edward S. Rogers, M.D.

National Technological Civil Protection Committee

Abel Wolman, Dr.Eng.
Arthur E. Gorman, alternate

BOOKS AND REPORTS

The Seven Myths of Housing—*By Nathan Straus. New York: Knopf, 1944. 320 pp. Price, $2.75.*

Mr. Nathan Straus, a life-long friend of housing, who has served as member of the New York City Housing Authority and as Administrator of the United States Housing Authority, has prepared a distillate of his long experience in a form which is particularly timely and important at the present moment. The "Seven Myths of Housing" which he discusses are as follows:

1. "There are no slums in my town"; every health officer knows the answer to this one.

2. "Public housing does not clear slums"; during the first your years of our federal housing program more than 78,000 unsafe or insanitary dwellings were eliminated, about half on the site of new projeects and about half in accordance with the law which calls for the elimination of an equivalent number of substandard dwellings when a new housing project is built on relatively unoccupied land.

3. "The government should buy up the slums"; the elimination of existing slums without providing new housing within the means of slum tenants might be very profitable to the real estate interests, but would in no sense improve the housing of the people. Only the construction of new low-rent homes will make the elimination of slums socially possible.

4. "Public housing is costly and extravagant"; the actual construction of the United States Housing Authority homes has cost one-quarter less than the average cost of similar housing produced by private enterprise. Mr. Straus gives an admirable analysis of the various factors which enter into rent, including actual construction costs, costs of dwelling equipment, architects' fees and overhead charges, cost of land, cost of utilities, taxes, operation, and upkeep.

5. "Public housing does not rehouse families from the slums"; that this is untrue is indicated by the fact that over 90 per cent of the families in public housing projects have family incomes of less than $1,200, which indicates that without federal aid they cannot live anywhere except in the slums.

6. "The slum dweller creates the slums"; experience in housing management fully demonstrates the fallacy of this assumption.

7. "Public housing injures private business and threatens to bankrupt the country"; public housing cannot injure private business, since no tenant is admitted unless his income is too low to purchase housing for an economic rent and unless he is living in an insanitary and substandard dwelling; a comprehensive and effective public housing program has not "bankrupted" England or Holland or Sweden, and it is not likely to "bankrupt" us.

Mr. Straus outlines a post-war goal of 900,000 new dwellings a year, of which about one-third should be low-rent housing provided by government subsidy, the other two-thirds to be built by private enterprise, with some government assistance in the middle income groups.

This is by all odds the best book on the philosophy of public housing now available. It should be on the desk of every health officer or other public health worker who wishes to be prepared to take an intelligent stand in regard to this vital health issue of the future.

C.-E. A. WINSLOW

Civilization and Disease — *By Henry E. Sigerist. Ithaca, N. Y.: Cornell University Press,* 1943. 255 pp. Price, $3.75.

This book is an excellent illustration of the thesis stated by Dr. Sigerist as follows:

> The historian is a member of the society in which he lives, sharing its hopes and fears, its aspirations and frustrations. Driven by a burning interest, by an overpowering urge, he sets out to consult the past—not the past at large, but a certain period, a sequence of events, personalities or problems. He wants to know what things were like, and to this end he assembles all the documents he can find. They become sources to him; he questions them, makes them talk, tries to understand and interpret them. Gradually a period, events, people of the past long dead become alive to him, an experience which he wants to share with others through the living word and in literary form. He recreates the past and by so doing makes the writing of history an artistic process.

In the present volume he discusses such subjects as civilization as a factor in the genesis of disease, and the interrelationships of disease with history, economics, law, religion, philosophy, science, literature, art and music.

In reading the present volume one has the sensation of sitting before an open fire with a pipe or a cigar and a decanter of port, listening to the conversation of a charming companion full of ancient lore and modern wisdom. The fascinating illustrations from medieval sources add greatly to its interest.

The health officer may question whether masks really proved effective during the influenza epidemic of 1918–1919 and might object to the statement that "since organic material decomposes it provides breeding ground for parasites which are a menace to man." To some of us it seems strange that Fracastorius and Kircher are not mentioned in connection with the history of the germ theory of disease, and that Sanctorius does not find place with Harvey among the pioneers in experimental physiology.

These would, however, be merely carping criticisms of a sound and scholarly and fascinating work. It is not intended as a textbook and it does not follow any special logical order, but there is a connecting link through nearly all the chapters, in Dr. Sigerist's emphasis upon the fact that

> . . . the task of medicine is to promote health, to prevent disease, to treat the sick when prevention has broken down and to rehabilitate the people after they have been cured. These are highly social functions and we must look at medicine as basically a social science. Medicine is merely one link in a chain of social welfare institutions that every civilized country must develop. If we have a maladjustment today, it is to a large extent due to the fact that we have neglected the sociology of medicine. For a long time we concentrated our efforts on scientific research and assumed that the application of its results would take care of itself. It did not, and the technology of medicine has outrun its sociology.

The closing paragraph of the epilogue which refers to the present world crisis is heartening:

> The more I study history, the more faith I have in the future of mankind, and the less doubt as to the ultimate result of the present conflict. The step will be taken from the competitive to the coöperative society, democratically ruled on scientific principles, to a society in which all will have equal duties and equal rights, not only on paper but in fact. We may not see it, but our children or their children will. While we are struggling, the foundations are being laid for a new and better civilization.

C.-E. A. WINSLOW

Twenty Years of Medical Research—*By Dorothy White Nicolson. New York: National Tuberculosis Association,* 1943. 97 pp. Price, $.50.

Nowhere has medical research taken a more varied pattern than in these United States during the past forty years, and at no time since the "Golden Age of Bacteriology" has the development of basic scientific knowl-

edge been more rapid. Though a majority of the outstanding contributions have been the work of talented individuals, often working independently, the growing complexity of the natural sciences has inevitably led to an increasing interdependence of investigators. It was recognition of the need of utilizing the resources of the allied sciences, as well as those of medicine, in broadening our basic knowledge of tuberculosis, that governed the Committee on Medical Research of the National Tuberculosis Association in determining its policy in 1920. This policy has been to encourage and assist a few investigators whose work promised to bridge to some extent an existing gap in our knowledge of tuberculosis or to provide more effective methods of diagnosis or treatment.

How wide a field has been covered by the researches of the following twenty years is indicated by a list of 21 projects supported by 35 grants. The projects have covered such diverse fields as Snow's classical study on the "Anatomy of the Lungs," coöperative studies on the chemistry of the tubercle bacillus and improvements in x-ray technic. That the results of the studies sponsored by this Medical Research Committee rank among the leading contributions to our knowledge of tuberculosis during the past two decades will be generally recognized by tuberculosis workers. Perhaps an even greater contribution is the demonstration of the possibilities of coördinated effort among investigators in medical science, for only by such coöperation can the necessary knowledges and technics of modern science be brought to bear upon a given problem. The effective application of this method calls for long-time planning and over-all supervision, and credit for the accomplishments of the National Tuberculosis Association's research program belongs in no small part to the Research Committee who, under the continued chairmanship of Dr. William Charles White, has encouraged and directed the twenty years of effort. For the student of tuberculosis the detailed bibliography gives convenient access to all individual reports of investigations associated with the committee's research program. ALTON S. POPE

Administration of Relief Abroad —*A Series of Occasional Papers, Edited by Donald S. Howard, Russell Sage Foundation* (130 East 22nd Street, New York 10). Price, $.20 each, or $1.50 for the set of eight.

The Near East Relief, 1915–1930, by James L. Barton.

The American Red Cross in the Great War, 1917–1919, by Henry P. Davison.

American Aid to Germany, 1918–1925, by Sidney Brooks. Together with *The Long Mile Beyond Berlin*, by Shelby M. Harrison.

The American Friends Service Committee in France, 1917–1919, by Rufus M. Jones. Together with *Problems Involved in Administering Relief Abroad*, by Clarence E. Pickett.

The American Relief Administration in Russia, 1919–1925, by H. H. Fisher.

Recent Operations of the American Friends Service Committee in Spain and France: Operations in Spain, 1937–1939, by John Van Gelder Forbes. *Operations in France, 1941–1942*, by the American Friends Service Committee.

American Red Cross Famine Relief in China, 1920–1921, from the Report of the China Famine Relief, American Red Cross.

Foreign Relief and Rehabilitation—A Bibliography, compiled by Sigrid Holt.

There was a world war twenty-five years ago which was widespread and terrible enough at the time. The

sympathy and funds of this country were poured out in efforts to repair some of the damage to human beings. Smaller disasters since have met with like response. The seven books listed were, fortunately, published by the different groups to inform the public who had supported the work.

Today suffering even more widespread is calling for plans for immediate and post-war relief. Effective administration is essential. Those who will share in this work, either in planning or in the field, will find these booklets very valuable.

They are case records. Each is a digest of the book abstracted, in one-tenth the size, using a current technic. Together they enable the reader to study the widely varied methods of the different groups, and profit by their experiences. With them should be read the report of the Atlantic City conference of the United Nations last fall. A new framework is appearing.

Clarence E. Pickett's remarks, at the close of Rufus M. Jones's book, combine sound views with a sense of the spirit that quickeneth.

One question comes to the reviewer. If height-weight tables are now out, what tool will the workers in nutrition give us today with which to select children for special feeding?

Perhaps the Russell Sage Foundation will add to our debt by binding this "First Series" under one cover.

HENRY R. O'BRIEN

Orthopedic Nursing — *By Robert V. Funsten, M.D., and Carmelita Calderwood, R.N., A.B. St. Louis: Mosby,* 1943. 602 pp. Price, $3.75.

This volume represents an approach to combined medical and nursing consideration of the care of patients with orthopedic conditions. It is presented by a physician and a nurse in a manner which will meet a long felt need of the nursing profession.

The introductory unit emphasizes the need for clearer understanding of the orthopedic content of all types of illness, as well as the relationship between body mechanics and posture and the efficiency of normal activity. In the second unit are grouped several chapters dealing with nursing care of cast and surgical patients, description and explanation of the use of orthopedic linens and restraints, and a general discussion of the responsibility of nursing in relation to physical therapy service.

The remainder of the book is divided into units in each of which related orthopedic conditions are grouped. The authors give excellent support to each other in presenting from the medical standpoint information necessary to the intelligent nursing care of orthopedic conditions, and from the nursing standpoint procedures necessary to the successful outcome of medical or surgical care instituted by the physician. Throughout the discussion of nursing responsibility emphasis is placed upon prevention and the part the nurse may play in this.

Orthopedic Nursing should prove valuable to both institutional and public health nurses giving care to orthopedic patients, and to all nurses who are interested in reducing the volume of preventable disabilities.

FLORENCE L. PHENIX

An Introduction to Foods and Nutrition—*By Henry C. Sherman and C. S. Lanford. New York: Macmillan,* 1943. 292 pp. Price, $2.00.

This book is a simple textbook on nutrition. It attempts: "first, to indicate the personal and public importance of the present-day knowledge of nutrition; second, to summarize with the greatest possible clarity and conciseness the needs of normal nutrition in terms of the accepted 'yardstick'; third, to introduce in an adequate manner the articles and types of food through which

our nutritional goals are to be reached; and finally to make this unified knowledge of foods and nutrition a functional part of household management and of family life and thought." Appendix A gives the approximate average nutritive values of 100 g. (edible portion) of several more common foods; appendix B is a simple glossary.

This book can be understood by anyone interested in nutrition. It is the simplest of Dr. Sherman's texts on nutrition but maintains the same high standards of his previous books.

FREDRICK J. STARE

Heart Disease Is Curable—*By Peter J. Steincrohn, M.D. New York: Doubleday Doran,* 1943. 193 pp. Price, $1.98.

The great advances being made by medicine and allied sciences have created a growing demand for popular books on specific diseases and their cure. It is only natural that people are curious about heart diseases, for they rank high as killers and make invalids of millions. The author of *Heart Disease Is Curable* has set himself the task of enabling people to satisfy their curiosity by writing a readable volume on the subject.

Many cardiologists and public health workers may be surprised by the title of the book, and justly so. While Dr. Steincrohn's text is consistent with his own definition of "curable," the phrase is misleading, since at the present time most diseases of the heart are not "curable" in the generally accepted sense of that word. It is also questionable as to what extent a book designed for the average layman should go into technical matters of diagnosis and treatment. For instance, in Chapter VII methods of treatment are presented which do not apply to all cardiac patients—"Sodium salt is eliminated from the diet as this tends to keep fluid in the tissues." Such instructions are not properly the content of a book for popular consumption. The author's recommendations in regard to frequent periods of rest and retiring from gainful activity are not possible except for those in the upper economic brackets, and at times may not be possible for them. There is no recognition of the difficult economic problem faced by the average wage earner with heart disease.

The psychological approach of the book is good. It places the patient in a happy frame of mind, particularly Chapter II, "Your Doctor Is Not a Bogeyman," and Chapters IX and XIII which, if condensed, would make a good pamphlet on heart disease.

DAVID D. RUTSTEIN

Biochemistry of the Fatty Acids—*By W. R. Bloor. New York: Reinhold,* 1943. 387 pp. Price, $6.00.

The subject of this book is indicated by the following quotation from page 286: "The whole of our knowledge (of the subject matter of the book) at present constitutes a picture puzzle of which only a few parts are available. Nevertheless, it is interesting and instructive to try to fit these parts together to get some idea of what the complete picture might be."

The greater part of the book is a scholarly and soberly critical summary of the enormous literature (about 1,770 citations) of which the above "few parts" are composed. Otherwise the book consists of stimulating interpretations which verify the correctness of the second sentence in the above quotation.

The composition of the book is indicated more specifically by its chapter headings, of which there are six as follows:

1. Chemistry: Descriptive and Analytical
2. Digestion and Absorption
3. Lipids of the Blood
4. The Lipids in Tissue
5. Lipid Metabolism
6. The Lipids of Secretions and Excretions

The book was apparently written for biochemists and physiologists rather than for clinicians or for commercial fat and oil technologists. However, members of all of these professions will find the book interesting, stimulating, and helpful.

Congratulations are due to the author for his excellent English, which adds to the readability and usefulness of the Book. O. S. RASK

Health Instruction Yearbook, 1943—*Compiled by Oliver E. Byrd, Ed.D. Foreword by Ray Lyman Wilbur, M.D. Stanford University: Stanford University Press*, 1943. 308 pp. Price, $3.00.

This yearbook is the first venture in what is intended to be a new project, namely, annual preparation of such books. The book is divided into twenty chapters which deal, respectively, with health as a social accomplishment; health as a social problem; nutrition and health; excretion and health; exercise and body mechanics; fatigue and rest; mental health and disease; heredity and eugenics; infection and immunity; chronic and degenerative disorders; habit-forming substances; the care of special organs; safety; health and physical environment; health services and facilities; family health; school health; occupational health; community health services, trends and probabilities.

The book is composed of brief excerpts taken from a wide variety of sources and grouped in chapters under the topic headings already listed. Taking Chapter VII, on Mental Health and Disease as an example, one finds in this chapter an item on national morale; one on war service and mental hygiene of the young-age group; another on mental health and the war in Germany and Britain; one on mental health and military service in the United States; one on a new type of homesickness encountered in the Navy; one on war fears in soldiers; a Census Bureau estimate of the number of patients in mental hospitals in the United States; some material on psychological weapons of war; a Census Bureau report on suicides in the United States and one on killings in America; an article on recreation and mental health; and one on mental hygiene in industry.

Each of the items is numbered, beginning with 1 and ending with 300 at the end of the last chapter. Bibliographical references are grouped at the end, which causes an endless amount of paging back and forth when these sources could have been listed just as well in immediate juxtaposition to the item.

Regardless of minor defects in the present volume, it represents a worthwhile endeavor and one which public health workers, especially those in health education, might hope to see continued year by year. Necessarily it is a collection of miscellany, but such a collection if well selected can be of the utmost value, since it may become a repository for the hard-to-find items which every health educator needs to enliven his material and which so often remain elusively just outside of memory's grasp.

In subsequent editions, however, it would seem that a better dating should be placed upon the book. This book is dated 1943, yet it was published in October and must have been compiled early in the year. Most of the references bear a 1942 date and a few are dated in 1941. This is really a 1942 yearbook issued in 1943. Before the series is any older this matter of dating should be rectified.

As for the author's judgment in selecting items for inclusion, that is hardly subject to criticism, since it is his judgment, which some readers will approve and others will disapprove. It will always be so.

As a source book this volume, especially if the series is continued as proposed, should find a place in every health educator's library.

W. W. BAUER

Notable Contributions to the Knowledge of Syphilis—*By Herman Goodman, M.D. (First Limited Edition.) New York: Froben Press*, 1943. 144 pp. Price, $3.00.

The author's introduction to the book is entitled "The Development of Medical Science Stressing Knowledge of Syphilis," which is a more appropriate title. Many of the pre-Columbian personalities mentioned were not notable contributors to the knowledge of syphilis but their names are linked in a long chronological chain which "gives the narrative much of its fascination," to quote Dr. Victor Robinson who wrote the foreword.

The author has performed a real service in recording, in one volume of 144 pages, so many data on the historical aspects of our knowledge of syphilis. Conclusions by the author are rightly omitted; each reader can make a more detailed study of the material cited for whatever purpose he has in mind.

Contemporary contributors to the knowledge of syphilis are merely listed by name, in the very complete Index of 720 names.

The assembly of the illustrations and preparation of the biographical and other data, as well as the citing of references to more complete discussion of various phases of the knowledge of syphilis, has been a task of great magnitude. The 143 illustrations are photographs or pre-photographic era drawings of the persons mentioned. Only two or three of those represented by pictures are now living.

The volume is useful as a source or reference book for libraries, and anyone interested in the historical phases of the development of the present knowledge of syphilis.

C. C. PIERCE

Nurses' Handbook of Obstetrics—*By Louise Zabriskie, R.N., and Nicholson J. Eastman, M.D. (New 7th Ed.) Philadelphia: Lippincott*, 1943. 714 pp. Price, $3.25.

The seventh edition of this textbook, completely revised and newly illustrated, comes at an opportune moment when our birth rate is high and mothers who were never able to afford hospital deliveries or skilled nursing care at home are now able to pay for the best. Nurses are attending more deliveries than in 1935. They are looking for the best and newest knowledge of maternity care and will find in this textbook a satisfactory source of information, as it combines, skillfully and smoothly, the field of public health, institutional and home care, with attention paid to teaching through classes, health educational material, and individuaul conferences. Teachers will find the material already organized for unit instruction, and for the older nurse who wishes to brush off her dusty knowledge of obstetrics—here is the book, with questions for self-examination which reveal the depth of that dust!

A book in its seventh (revised) edition grows richer with age or, to use another simile, cream rises on standing. While no one textbook ever claims perfection and no real student (or teacher) is ever satisfied with a sole source of information on any subject, this textbook shows the effect of many constructive suggestions and reëditing. It is now as comprehensive a reference as a nurse—any nurse—could hope to find in a single volume.

DOROTHY DEMING

A SELECTED PUBLIC HEALTH BIBLIOGRAPHY WITH ANNOTATIONS

RAYMOND S. PATTERSON, PH.D.

Let's Have More Safe Milk—As part of a public works program the suggestion is made that new municipal pasteurizing plants, and additions to present ones, to the tune of $8,000,000 —not counting country pasteurizers— would prevent a lot of milk-borne disease, increase milk consumption, and help get people back to work. Small change, these days, but an important expenditure, for there were 408 milk-borne epidemics involving 16,000 cases in a recent decade.

ANDREWS, J., and FUCHS, A. W. National Inventory of Needs for Sanitation Facilities. Pub. Health Rep. 59, 6:189 (Feb. 11), 1944.

And Safer Drinking Water—Prepared by the Public Health Service, this manual is for the guidance of local health officials to secure greater uniformity and safety in the control of water supplies.

ANON. Sanitation Manual for Public Ground Water Supplies. Pub. Health Rep. 59, 5:139 (Feb. 4), 1944.

Here's a Brave Man for You—Direct treatment of the teeth with fluoride-containing solutions will reduce dental caries. Probably this is a better method than adding fluorine to public water supplies, concludes the writer who adds without any face-saving qualification, "The immediate possibilities for the control of caries are extremely bright."

BIBBY, B. G. Use of Fluorine in the Prevention of Dental Caries. J. Am. Dent. A. 31, 3:228 (Feb. 1), 1944.

New Ideas Department—For a rank layman to annotate a paper of which he understands not a quarter of the words is the height of something or other, but here goes: It seems you take some spleen and rib marrow of a fresh human cadaver, grind the tissues and dry them. This antigen is diluted and injected into animals, much as we do to obtain antibacterial sera. The titer of cytotoxins is determined by complement-fixation. In small doses this anti-reticular cytotoxic serum stimulates the connective tissues of the body to intensify active immunity against all sorts of infections.

BOGOMOLETS, A. A. Anti-Reticular Cytotoxic Serum as a Means of Pathogenic Therapy. (and) MARCHUK, P. D. A Method of Preparing and Preserving Anti-Reticular Cytotoxic Serum. Am. Rev. Soviet Med. 1, 2:101 (Dec.), 1943.

Present-day Pneumonia Experience—Among 90,000 shipyard workers in 1943 there was a pneumonia frequency rate of 9.5 per 1,000. Of 864 patients over 70 per cent had pneumococcal pneumonia. For some of these patients, both serum and sulfonamides were given, the gross mortality being 8.2 per cent.

COLLEN, M. F., *et al.* A Study of Pneumonia in the Shipbuilding Industry. J. Indust. Hyg. & Toxicol. 26, 1:1 (Jan.), 1944.

Had This Occurred to You?—When birth rates vary considerably, the infant death rates, as ordinarily computed, may be no longer accurate, for many infant deaths will be from among babies born during the previous year. Hence a rapidly declining birth rate may produce a fictitiously high infant death rate. This paper suggests how corrective adjustments may be made.

DE PORTE, J. V. Rate of Infant Mortality Adjusted to a Rapidly Changing Birth Rate. Health News (New York State). 21, 5:20 (Jan. 1), 1944.

How Many Have Cancer and What Kinds?—About 4 of every 1,000 city dwelling Americans have, or have had, cancer. About a half million people are under treatment for cancer at any given time. 300,000 new cases being diagnosed each year. Case rates are higher among women and, in both sexes, increase each decade of life. In almost half the males and three-quarters of the females, cancer occurs in either the digestive or genital systems. These are only a few of the arresting answers to our questions.

DOAN, H. F. Illness from Cancer in the United States. Pub. Health Rep. (beginning). 59, 2:33 (Jan. 14), 1944.

Care for the Needy Sick—New York State has worked out a practical pattern of public medical care for the needy which supplants archaic "poor doctor" practices, places medical men in charge of medical aspects, and builds a whole new approach to government-physician relationships, in some respects, out-Beveridging the Beveridge plan itself.

DOWLING, L. C. New York State Public Medical Care Program. Pub. Welfare. 2, 2:44 (Feb.), 1944.

Strep Types and Scarlet Fever—All epidemiologists who may be struggling with the problem of controlling streptococcal infections will be interested in the findings of this army experience in which soldiers with pharyngitis-tonsilitis were hospitalized regardless of existence or nonexistence of scarlatiniform rashes. The study of streptococcal types is most revealing.

HAMBURGER, M., JR., *et al.* Ability of Different Types of Hemolytic Streptococci to Produce Scarlet Fever. J.A.M.A. 124, 9:564 (Feb. 26), 1944.

Health Service vs. Medical Practice—Why did you join the local health services? a British M. O. H. asked his colleagues. Nearly half said they joined because of their interest in some specialty. Also nearly half liked the idea of regular hours and fixed salary. A fifth had tried general practice and didn't like it, and 43 per cent believed that they could best serve the community through preventive medicine. A comparative poll of American health officers might produce illuminating comparisons.

JOLLY, R. H. H. The Public Health Service after the War. Pub. Health. 57, 4:89 (Jan.), 1944.

This Paper Is about the Blue Cross—Sanitary engineers, chemists, bacteriologists, inspectors, and educators will view with some curiosity the following resounding and unqualified declaration, "American medicine, American dentistry, American nursing, and American hospitals have given our people the world's finest health service. With respect to education, service, and research, American health service has reached a degree of perfection never realized in any other country on earth." The theme of the peroration is: Everybody in the Blue Cross by 1960.

MANNIX, J. R. Voluntary Non Profit Prepayment for Health Care. J.A.M.A. 124, 9:571 (Feb. 26), 1944.

They Are Still Being Born One a Minute—Medical departments in five industrial plants, widely scattered, conducted a large scale demonstration of the value of cold vaccines, of all sorts, and found no evidence of effective prophylaxis against the frequency or the severity (including complications) of colds. Do you suppose this experience will have any influence upon the makers, the givers, or the gullible receivers of cold vaccines?

MCGEE, L. C., *et al.* "Cold Vaccines" and

the Incidence of the Common Cold. J.A.M.A. 124, 9:555 (Feb. 26), 1944.

One State Is Awake at Any Rate—Brave new plans for an ambitious health and welfare service for the State of Maine should serve to inspire similar agencies to bestir themselves to do something to anticipate post-war health problems in the other 47 states.

PAGE, H. O. Preliminary Statement on Post-war Planning in Health and Welfare. Pub. Welfare. 2, 2:36 (Feb.), 1944.

A Desire to Save Babies Is Needed—Methods employed by the city of Chicago to reduce neonatal deaths are described. Adequate care for premature infants, better obstetrical practice, prevention of infection are the chief infant life saving measures. If they were employed throughout the nation 40 per cent of all infant deaths might be prevented. Three additional papers by Sage, E. C., Torpin, R., and Tyson, R. M., complete this timely and useful symposium. Child hygienists won't neglect this series: many others of us should not.

POTTER, E. L. The Lesson to Be Learned from a Study of Infant Deaths. J.A.M.A. 124, 6:336 (Feb. 5), 1944.

Health for War Workers—War has introduced a host of new chemicals of unknown toxicity and has accelerated the use of older substances known to be hazardous. Modern industry rests on a chemical base and is constantly creating new problems in industrial hygiene. You will recognize the truth in these observations of the joint authors of this paper, if you read it.

TABERSHAW, I. R., and BOWDITCH, M. Industrial Hygiene. New Eng. J. of Med. 229, 27:1003 (Dec. 30), 1943.

BOOKS RECEIVED

CLINICAL TROPICAL MEDICINE. By Z. Taylor Bercovitz. New York: Paul B. Hoeber, 1943. 957 pp. Price, $14.00.

TO LIVE IN HEALTH. By R. Will Burnett. New York: Silver Burdett Company, 1943. 332 pp. Price, $1.96.

MEDICINE AND THE WAR. By William H. Taliaferro. Chicago: The University of Chicago Press, 1943. 193 pp. Price, $2.00.

MANUAL FOR WATER WORKS OPERATORS. By Texas Water Works Short School. Revised edition. Austin, Tex.: Texas State Department of Health, 1943. 392 pp. Price, $3.00.

COSTS OF DENTAL CARE FOR ADULTS UNDER SPECIFIC CLINICAL CONDITIONS. By Dorothy Fahs Beck. Lancaster, Pa.: Lancaster Press, 1943. 306 pp.

A MANUAL OF METHODS FOR ORGANIZING AND MAINTAINING A CENTRAL TUBERCULOSIS CASE REGISTER. By Edward X. Mikol. New York: National Tuberculosis Association, 1943. 70 pp. Price, $1.00.

STATISTICAL REPORTING IN PUBLIC HEALTH NURSING. By Margaret L. Shetland. New York: National Organization for Public Health Nursing, 1943. 56 pp. Price, $.50.

PREPAYMENT MEDICAL CARE ORGANIZATIONS. By Margaret C. Klem. Washington: Bureau of Research and Statistics, 1943. 252 pp.

HANDBOOK FOR THE MEDICAL SECRETARY. By Miriam Bredow. New York: McGraw-Hill, 1943. 253 pp. Price, $2.25.

MEDICAL CARE OF THE DISCHARGED HOSPITAL PATIENT. By Frode Jensen, H. G. Weiskotten and Margaret A. Thomas. New York: The Commonwealth Fund, 1943. 94 pp. Price, $1.00.

DIFCO MANUAL. By Difco Laboratories. 7th ed. Detroit: Difco Laboratories Inc., 1943. 239 pp.

HANDBOOK FOR THE ETIOLOGY, DIAGNOSIS AND CONTROL OF INFECTIOUS BOVINE MASTITIS. By Ival Arthur Merchand and R. Allen Packer. Minneapolis: Burgess Publishing Company, 1943. 66 pp. Price, $1.25.

SAFE CONVOY. By William J. Carrington. New York: Lippincott Company, 1943. 256 pp. Price, $2.50.

BABY DOCTOR. By Isaac B. Abt. New York: Whitlesey House, 1943. 310 pp. Price, $2.50.

MODERN pH AND CHLORINE CONTROL. 6th ed. Baltimore: W. A. Taylor & Company, 1943. 83 pp.

ASSOCIATION NEWS

SECOND WARTIME PUBLIC HEALTH CONFERENCE AND
SEVENTY-THIRD ANNUAL BUSINESS MEETING
AMERICAN PUBLIC HEALTH ASSOCIATION
New York, N. Y., October 3–5, 1944
Headquarters: Hotel Pennsylvania

APPLICANTS FOR MEMBERSHIP

The following individuals have applied for membership in the Association. They have requested affiliation with the sections indicated.

Health Officers Section

John W. Buckley, M.D., Orange Health Unit, Orange, Texas, Asst. Director, Jefferson-Orange County Health Units

Emilio Budnik-B., M.D., 615 N. Wolfe St., Baltimore 5, Md., Asst. General Inspector, Chilean Public Health Service

Jose Cobian-Alvarez, M.D., Ysabela 5, Guayanilla, Mayaguez, Puerto Rico, Health Officer

Capt. Angelo A. DiDonna, M.C., 34 Jay St., Schenectady, N. Y., Chief, Venereal Disease Section, Station Hospital, Camp Rucker, Ala.

Manuel A. Frias, M.D., Bruno St., Guayama, Guayama, Puerto Rico, Health Officer

A. M. Garcia-Ubarri, M.D., Alianza 6, Santurce, Puerto Rico, Health Officer

Hector M. Gonzalez, M.D., St. A. Lopez, Humacao, Puerto Rico, Medical Officer

Barbara Hunt, M.D., Lauderdale County Health Dept., Meridian, Miss., Asst. Director

Rafael U. Lange, M.D., Barcelona, Mayaguez, Puerto Rico, Health Officer

Angel M. Marchand, M.D., Monterrey Apt. 1A, Terraza Parque, Santurce, Puerto Rico, Chief, Bureau of Tuberculosis, Health Dept.

J. W. O'Neill, M.D., 351 Cherry St., Fremont, Mich., Director, District Health Dept.

George P. Rapp, York Rd. and Horace Ave., Abington, Pa., Health Officer

Homer D. Rose, M.D., Wentzel Bldg., Sonora, Calif., County Health Officer

Nicolas Sanabria-Fernandez, M.D., 22 Esperanza St., San German, Puerto Rico, Medical Officer, Public Health Unit

Jose M. Santiago, M.D., Betancesst, Vega Baja, Puerto Rico, Health Officer, Insular Dept. of Health

Francisco Sein, M.D., Vilella 12, Lares, Puerto Rico, Chief, Public Health Unit

Armando Silva-Navarro, M.D., Camuy, Aguadilla, Puerto Rico, Medical Inspector, Dept. of Health

Beatrice E. Steiner, M.D., 35 Ft. Washington Ave., New York 32, N. Y., Health Officer-in-Training, Dept. of Health

Gertrud Weiss, M.D., 175 Pinehurst Ave., New York 33, N. Y., Health Officer-in-Training, Dept. of Health

S. G. Zando, M.D., Cinderella Bldg., Williamson, W. Va., Mingo County Health Officer

Laboratory Section

Ruby J. Atkins, 1204 Primrose Terrace, Selma, Ala., Senior Bacteriologist, State Health Dept.

Mary H. Baker, 2627 Clyde Ave., Los Angeles 16, Calif., Public Health Laboratory Technician, Los Angeles County Health Dept.

May E. Barry, 1400 Fell St., San Francisco

17, Calif., Clinical Medical Technologist, Southern Pacific Hospital

Major Abram S. Benenson, M.C., Carlisle Barracks, Pa., Instructor in Military Sanitation

Walter V. Benion, Unit 2, 183rd Station Hospital, APO 942, Seattle, Wash., Laboratory Technician

Melvin F. Burgin, 3041 S. 8th St., Abilene, Tex., Laboratory Director, Abilene-Taylor County Health Unit

Vincent J. DelGiudice, 183rd Station Hospital, APO 942, Seattle, Wash., Laboratory Technician

Lt. Thaddeus J. Domanski, Sn.C., 225 E. 79th St., New York, N. Y.

Robert E. Evans, M.S., 939 Margate Terrace, Chicago 40, Ill., Director, Div. of Laboratories, Evanston Health Dept.

Capt. Hugh F. Fitzpatrick, Sn.C., 141st General Hospital, Memphis 15, Tenn., Chief of Laboratory Service

Manuel M. Guillermety, P. O. Box 3803, Santurce, Puerto Rico, Supt., Guaynabo Filtration Plant

Paul W. Jones, 183rd Station Hospital, APO 942, Seattle, Wash., Laboratory Technician

Capt. Arthur C. Jordan, Sn.C., Station Hospital, Amarillo Air Field, Amarillo, Tex., Asst. Chief, Laboratory Services

Lucile W. Kircher, Greenwich Hospital, Greenwich, Conn., Senior Technician

John W. Martello, 183rd Station Hospital, APO 942, Seattle, Wash., Laboratory Technician

Dr. Alfred N. Metcalfe, P. O. Box 403, Harrisburg, Pa., Chief, Pa. Bureau of Animal Industry Lab.

Miguel Alonzo Molina, M.D., Calle Arce 41, San Salvador, El Salvador, C. A., Chief, Central Laboratory, Rosales Hospital

Constance O. Odden, M.S., 310 Builders Exchange, Duluth, Minn., Bacteriologist-in-charge, State Dept. of Health

Martha G. Papadakis, 1118 Chanslor Ave., Richmond, Calif., City Bacteriologist

Elizabeth E. Pelkus, 113 Steamboat Rd., Great Neck, N. Y., Bacteriologist, Long Island College of Medicine

John L. Perhab, P. O. Box 390, Beverly Hills, Calif., Supt. and Mgr., Water Dept., City of Beverly Hills

Edith Scorup, M.S., 136 State Capitol, Salt Lake City, Utah, Junior Serologist and Bacteriologist, State Board of Health

Kathleen E. Shanahan, 6415 3rd St., N.W., Washington 12, D. C., Serologist, Arlington County Laboratory

Capt. Henry A. Stiff, Jr., Sn.C., Station Hospital, Camp Howze, Tex., Asst. Camp Medical Inspector and Hospital Inspector

Raymond D. Tice, M.D., Cor. 3rd and Juniper Sts., Quakertown, Pa., Chief, Chest Clinic, Quakertown Hospital

Virgil S. Troy, M.S., Continental Can Co., Inc., 4645 W. Grand Ave., Chicago, Ill., Chief, Bacteriological Section, Research Dept.

Helen E. Vance, 2435 S. 5th E., Salt Lake City 5, Utah, Senior Bacteriologist and Serologist, Div. of Labs., State Board of Health

Charles L. Walker, M.A., 183rd Station Hospital, APO 942, Seattle, Wash., Laboratory Technician

Virginia R. Wilson, Station Hospital, Camp Swift, Tex., Bacteriologist

Jean C. Youngberg, 1522 Ensley Ave., Los Angeles 24, Calif., Bacteriologist, Los Angeles County Health Dept.

Vital Statistics Section

A. Joan Klebba, 1200 16th St., N.W., Washington, D. C., Biostatistician, Office of the Coördinator of Inter-American Affairs

Deward E. Waggoner, M.S.P.H., 816 Oregon Bldg., Portland, Ore., Director, Div. of Vital Statistics, State Board of Health

Engineering Section

Jose A. Abdelnoor, Agueduct of Ponce, Puerto Rico, Chemist and Director, Ponce Water Works

Thomas J. Blair, 179 Summers St., Charleston 1, W. Va., General Manager, West Virginia Water Service Co.

Jose del Carmen-Echevers, 1015 E. Catherine St., Ann Arbor, Mich., Asst. Sanitary Engineer, Panama Government

Reinerio Castellon-Flores, Suau St., Santurce, Puerto Rico, Electrical Engineer, Dept. of Health

Isidoro A. Chapa, Jr., Station Hospital, Medical Inspector's Office, Camp Hood, Tex., Senior Sanitary Technician

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Ernesto Gonzalez-Casillas, Principal St., Asacuo, Puerto Rico, Trainee in Public Health, School of Tropical Medicine

Patrick L. Hughes, 727 Chiles St., Lakeland, Fla., Senior Sanitarian, Polk County Health Dept.

K. A. Kearn, 171 Second St., San Francisco 5, Calif., Division Manager, Wallace & Tiernan Sales Corp.

Bernard J. Langdon, Box 47, Olathe, Kansas, Asst. Engineering Sanitarian, U. S. Public Health Service

James L. Maston, General Delivery, Richland, Wash., General Sanitarian, Hanford Engineer Works

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Carlos Rivera-Gonzalez, Villaverde No. 13A-Hos. Santurce, Puerto Rico, Student, School of Tropical Medicine

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Manuel A. Torres-Aguiar, Urb. Stadium, Caguas, Puerto Rico, Student, School of Tropical Medicine

Industrial Hygiene Section

Ila B. Banfield, Nellis, W. Va., Nurse

Hazel D. Jamison, R.N., Kopperston, W. Va., Visiting Nurse, Koppers Coal Div.

Lt. Col. Henry N. Parrish, Sn.C., Hdq.A.S.C., Patterson Field, Fairfield, Ohio, Chief, Industrial Hygiene Engineering, A.A.F., Air Service Command

Americo Rodriguez-Nazario, Boulevard Santiago Veve, Mayaguez, Puerto Rico

Food and Nutrition Section

Teresa Anglero-Diaz, San Lorenzo, Puerto Rico

Dorothy DeHart, M.A., Roosevelt Hospital, 428 W. 59th St., New York 19, N. Y., Chief Dietitian

Marion E. French, 605 W. 112th St., New York 25, N. Y., Nutritionist, City Dept. of Health

Mathew Klein, M.S., 18 Shephard Ave., Newark, N. J., Owner, Garden State Dairy Lab.

Mildred Krohn, 703 State Bldg., Los Angeles 12, Calif., District Nutritionist, State Dept. of Public Health

Loucille G. Langham, M.S., 1901 Hopi Trail, Austin, Tex., Nutrition Consultant, State Dept. of Health

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Ernest S. Tierkel, V.M.D., 328 W. 89th St., New York, N. Y., Veterinarian, Meat Inspection Div., W.F.A.

Walter Wilkins, M.D., 1800 14th St., N., Arlington, Va., Public Health Nutrition Consultant, U. S. Public Health Service

Maternal and Child Health Section

Lily G. Harris, D.O., 461 Bellevue Ave., Oakland, Calif., Director, East Bay Osteopathic Clinic

Keith O. Taylor, 5105 Dover St., Oakland 9, Calif., Administrator, Children's Hospital

Public Health Education Section

Florence M. Albrecht, 1101 Martin Place, Ann Arbor, Mich., Student, Univ. of Michigan

Mary C. Baker, 33 River St., Boston, Mass., Health Education Worker, Div. of Child Hygiene, State Health Dept.

Wilma Becknell, 228 S. Thayer St., Ann Arbor, Mich., Student, Univ. of Michigan

Clarissa E. Boyd, 169 Van Houten St., Paterson 1, N. J., Acting Exec. Sec., Passaic County Tuberculosis and Health Assn.

Emile Chancy, 800 Oxford Rd., Ann Arbor, Mich., Student, Univ. of Michigan

Grace D. Cole, M.A., 36 West Main St., Middletown, N. Y., Exec. Sec., Orange County Health Assn. Inc.

Cecilia C. Conrath, 1101 Martin Place, Ann Arbor, Mich., Trainee in Health Education, Univ. of Michigan

Eva G. S. Craddick, 2126 Bancroft Way, Berkeley, Calif., School Nurse, Richmond City Schools

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Health and Social Welfare, Quebec, P.Q., Canada, Director of Health Education

Benjamin E. Holsendorf, Phar.D., 141 St. Marks Place, St. George, Staten Island, N. Y., Instructor in Rodent Control, City Health Dept.

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Eli Naser Nahas, M.D., St. Agnes Hospital, White Plains, N. Y., Interne

Georgina A. Pastor, M.A., Villamil No. 27, Santurce, Puerto Rico, Medical Social Worker

Charlotte Payne, 350 Madison Ave., New York 17, N. Y., National Adjutant, Women's Field Army, American Society for the Control of Cancer

Vicente Roure, M.D., Cidra, Puerto Rico, Medical Officer

Lloyd W. Schlegel, 609 Josephine, Flint, Mich., Student, Univ. of Michigan

James H. Stone, Dept. of Public Health, Shawnee, Okla., Trainee in Health Education, Shawnee-Pottawatomie County Health Dept.

Ernest P. Von Allmen, 636 Euclid Ave., Berkeley, Calif., Exec. Sec., Alameda County Tuberculosis and Health Assn.

Public Health Nursing Section

Pauline F. Band, M.A., 117 Meigs St., Rochester 7, N. Y., Public Health Instructor, Genesee Hospital

Pauline J. Bateman, Granville County Health Dept., Oxford, N. C., Staff Nurse

Grace F. Borah, R.N., 814 Main St., Mt. Vernon, Ill., Orthopedic Nurse, Univ. of Illinois, Div. of Services for Crippled Children

Leona V. Bowman, R.N., Johns Hopkins Hospital, Baltimore 5, Md., Instructor, Dispensary Visiting Nurse Service

Doris T. deSainz, R.N., Virtud No. 54, Ponce, Puerto Rico, Public Health Nurses Supervisor, Dept. of Health

Leone H. Doepke, R.N., 1010 Ninth St., Merrill, Wis., City Nurse, Merrill Health Dept.

Margaret B. Dolan, R.N., 210 Kenan Hall, Chapel Hill, N. C., Student, Univ. of North Carolina

Mary M. Dunn, 432 S. College, Bloomington, Ind., Administrative Head, District Health Dept., No. 16, State Board of Health

Mildred E. Dunn, R.N., 557 Alden Drive, Rahway, N. J., Supervisor, Nursing Service, Plant Health Dept., Merck & Co.

Edith Evendoll, R.N., 517 Fourth St., Huntington, W. Va., School Nurse, Board of Education

Sarah V. Fahey, 1121–8th St., Huntington, W. Va., Staff Nurse, Metropolitan Life Insurance Co.

Carmen Figueroa-Iantiago, R.N., 19 Martin Corchado St., Ponce, Puerto Rico, Public Health Nurse

Emilia Figueroa-Rowton, Public Health Unit, Aguadilla, Puerto Rico, Supervisor of Public Health Nurses

Minnie Fink, R.N., 4642 Lindell Blvd., St. Louis 8, Mo., Public Health Nurse, U. S. Public Health Service

Lucille D. Fuller, R.N., 115 York St., New Haven 10, Conn., Student, Yale Univ. School of Medicine

Ruth Kiedaisch, R.N., 1020 Garfield St., McMechen, W. Va., School Nurse, Marshall County School Board

Hope A. McCutcheon, R.N., 3364 Ozark, Houston 4, Tex., Field Supervisor of Public Health Nursing, City Health Dept.

Hermina W. Palan, R.N., 1255 Chartiers Ave., McKees Rocks, Pa., Student, Duquesne Univ.

Esperanza Rivera de Jesus, 10 St. No. 8 Capetilla, Rio Piedras, Puerto Rico, Staff Nurse, Public Health Dept.

Monserrate Rosado-Mendez, 66 Martinez St., Barrio Obrero, Santurce, Puerto Rico, Public Health Nurses Supervisor, Dept. of Health

Julia C. Thompson, R.N., 1506 Washburn, Topeka, Kan., District Public Health Nursing Supervisor, City-County Health Dept.

Epidemiology Section

Arthur C. Curtis, M.D., 2008 Broadway, Little Rock, Ark., Director, Div. of Tuberculosis Control, State Health Dept.

Gustaf A. Hedberg, M.D., Nopeming Sanatorium, Nopeming, Minn., Medical Director and Superintendent

Major E. Ross Jenney, M.C., Room [illegible], The Pentagon, Washington, D. C., Public Health Officer, Military Government, Army of the United States

James H. Steele, D.V.M., M.P.H., U. S. Public Health Service, San Juan, Puerto Rico, Asst. Sanitarian (R)

School Health Section

Marion E. Bigelow, R.N., Orwell, Vt., Staff Nurse, State Health Dept.

Unaffiliated

Catherine R. Allen, R.N., 31 Beresford Ave., Highland Park, Mich., Student, Univ. of Michigan

Franz Goldmann, M.D., 16 Glenbrook Ave., Hamden 14, Conn., Assoc. Clinical Professor of Public Health, Yale School of Medicine

Archibald F. Kowald, 200 E. Wells, Milwaukee 2, Wis., Lieutenant, Sanitary Inspection, Milwaukee Health Dept.

George P. Miley, M.D., 230 N. Broad St., Philadelphia, Pa., Clinical Professor of Pharmacology, Hahnemann Medical College and Hospital

Charles H. Okey, M.S., 192 Kimberly Ave., New Haven, Conn., Student, Dept. of Public Health, Yale Medical School

DECEASED MEMBERS

Ezra G. Carter, Dr.P.H., Logan, Utah. Elected Member 1924, Public Health Education Section

Paul Hansen, Chicago, Ill. Elected Member 1905, Elected Fellow 1922, Charter Fellow, Engineering Section

Olaf Haraldson, M.D., Minot, N. D. Elected Member 1942, Health Officers Section

William M. Randolph, M.D., Charlottesville, Va. Elected Member 1936, Public Health Education Section

William V. Sanford, M.D., (Major M.C.), Ripley, Tenn. Elected Member 1930, Health Officers Section

Armin V. St. George, M.D., New York, N. Y. Elected Member 1934, Laboratory Section

DR. HALVERSON APPOINTED CHAIRMAN OF THE COMMITTEE AN ADMINISTRATIVE PRACTICE

The Executive Board has announced the appointment of Dr. Wilton L. Halverson, State Director of Public Health in California, as Chairman of the Committee on Administrative Practice. He succeeds Dr. Henry F. Vaughan, resigned.

Dr. Halverson is a graduate in medicine from the College of Medical Evangelists in 1929. For some years he has been Professor of Public Health and Preventive Medicine in his alma mater. In 1932 he received a doctorate in public health from Yale University. Dr. Halverson served as District Health Officer in the Los Angeles County Health Department for four years and as Health Officer of Pasadena from 1934 to 1942, when he became Health Officer of Los Angeles County. He was appointed to his present post as State Director of Public Health in 1943 by Governor Warren. Dr. Halverson has served as Vice-President of the American Public Health Association and has been active in the affairs of the Western Branch. He is a Fellow of the Health Officers Section. One of his first official acts as State Director of Public Health was to authorize a survey of the department's organization and activities, which was completed under the auspices of the Committee on Administrative Practice in 1943. Dr. Halverson has recently been appointed a member of the Board of Scientific Directors of the Rockefeller Foundation.

A.P.H.A. MERIT SYSTEM UNIT SERVES SIXTEEN STATES

The Association's Merit System has announced that more than 70 examinations have now been prepared in response to requests from merit system and civil service agencies in 16 states. Questions for public health nursing examinations have been most in demand. Other examinations available include health officers, sanitarians, and laboratory workers in various grades. The public health engineering field will shortly be covered, and examinations for various medical specialists in public health will be undertaken by the staff of the Unit.

EMPLOYMENT SERVICE

The Association Employment Service seeks to bring to the attention of appointing officers the names of qualified public health personnel and to act as a clearinghouse on employment. This is a service of the Association conducted without expense to the employer or employee.

From the registry of persons available, selected announcements are published from time to time. Appointing officers may obtain lists of all registrants on request.

Address all correspondence to the Employment Service, American Public Health Association, 1790 Broadway, New York 19, N. Y.

POSITIONS AVAILABLE

Wanted: A physician trained in tuberculosis to assume administrative control of the Bureau of Tuberculosis in an eastern city of 200,000 population. Salary $4,500–$5,031 plus cost of living adjustment. Address **Box B**, Employment Service, A.P.H.A.

Sanitarian wanted: Preferably with Bachelor's degree or engineering degree, plus public health experience or training. Must have own car. Applicant with lower qualifications will be offered an opportunity to take a short, free indoctrination course. Salary $1,920 per year with travel allowance of $50 per month, if qualified. Apply Dist. Dept. of Health, No. 6, Central Office, Newberry, Mich., Dr. Franklin.

Wanted: Pediatrician to supervise medical care of children at cerebral palsy center being established by private institution in cooperation with Illinois Division of Services for Crippled Children. Salary commensurate with experience and training. For further information write Lawrence J. Linck, Director, Division of Services for Crippled Children, 1105 So. Sixth St., Springfield, Ill.

The Department of Health, New Jersey, whose industrial health activities have expanded rapidly during the present war, has announced its need for two full-time industrial hygiene physicians for its Industrial Hygiene Service. As one of the leading states in the production of war materials, New Jersey offers unusual opportunities for gaining experience in occupational disease control besides giving the physician a chance to make a valuable contribution to the war effort. The principal duties of the selected physicians will be consultations in regard to the following: control of occupational diseases; industrial toxicological problems; evaluation of adequacy of plant medical services; promotion of measures which will reduce absenteeism from non-occupational causes; and conduct of industrial health education activities. Physicians interested in these positions should write to the Department of Health, Trenton, N. J.

The Milwaukee Health Department is interested in obtaining an instructor in hospital nursing to conduct a student educational program in its communicable disease hospital. Salary offered begins at $125 per month with maintenance, and increases of $5 per month each year until $135 has been reached. To this basic salary there has been added a cost of living bonus of $30.64 per month, making the total beginning salary $155.64 plus maintenance. Apply to Dr. G. F. Burgardt, Deputy Commissioner of Health, Milwaukee, Wis.

Wanted: Public health physicians in Texas. George W. Cox, M.D., State Health Officer, Austin, Tex.

Hawaiian Territorial Board of Health seeks trained engineer to supervise rodent plague control program. Salary range from $331.67 to $398.33 per month subject to retirement deductions plus bonus. Position under Territorial civil service system with classification of P-4. For further details address A.P.H.A. Employment Service.

Wanted: Physical therapist by Crippled Children's Division. Should be graduate of a school of nursing or of college, with a major in physical education or science; have completed a course in physical therapy; should have had experience in physical therapy, preferably with children. Write for application blank to Merit System Council, 416 Henry Building, 309 S.W. 4th Ave., Portland 4, Ore.

Psychiatric case worker desired for mental hygiene clinic, Department of Health, Peoria, Ill.

Senior Sanitarian, Alaska Health Department. Minimum requirements 2 years college, 6 months public health course, 2 years' experience. Two additional years' experience acceptable instead of each year college. Monthly salary $235-

$265. Mary B. Pool, Alaska Merit System, Juneau.

Michigan announces civil service positions now open for orthopedic public health nurse, Grades II and III classes with the Michigan Crippled Children's Commission. Salary range: Grade II $230 to $270 per month; Grade III $280 to $340 per month. Grade II not under 25, Grade III not under 25. Must have completed course in orthopedic nursing or physical therapy in approved school. For Grade III position a full-time course of at least 9 months' duration is required. Must have 3 years' experience in public health nursing, one year of which shall have been in supervisory capacity. For Grade III position one additional year of nursing and one additional year of supervisory experience required. Eligibility for certificate in public health nursing and registration as a nurse in Michigan. For further information write Michigan Civil Service Commission, 310 No. Grand Ave., Lansing 4, Mich.

Wanted: Sanitary engineer or chemist to assist in stream pollution survey and later in study of sewage treatment. Should be qualified to perform chemical and bacteriological analyses of water and sewage and chemical analyses of industrial wastes. Nine months employment with possibility of indefinite continuation, particularly if person is willing to do some other types of analytical work, including coal analysis. Salary $175–$250 per month depending on qualifications. Women considered. Address communications to Prof. Gilbert H. Dunstan, Dept. of Sanitary and Public Health Engineering, University of Alabama, Box 1996, University, Ala.

Industrial **Hygiene Toxicologist.** Calls for person of chemical or chemical engineering background. Position, supervising of chemical work of industrial hygiene service and industrial hygiene laboratory; designing special apparatus for field studies on occupational disease problems; conducting field and laboratory analyses of toxicological exposures in industry; keeping records, interpreting results and preparing records. Requirements, knowledge of chemical laboratory methods and equipment; procedures for qualitative and quantitative analysis of organic and inorganic chemistry; knowledge of chemical methods of determining toxic materials in industry; familiarity with petrographic methods of mineralogical analysis. Immediate temporary appointment will be made, to be followed later by civil service examination to determine permanent status. Salary $2,900 base, plus $100 a year war adjustment, or total of $3,000 per year. Travel expenses also allowed. Must be U. S. citizen. Resident of any state may apply. Write J. Lynn Mahaffey, M.D., Director of Health, State Department of Health, Trenton 7, N. J.

Wanted: Public Health Nurse. Salary $175 per month and full maintenance, plus $25 per month for car expense. Must furnish own car. Write Paul D. Crimm, M.D., Director Boehne Tuberculosis Hospital, Evansville 12, Ind.

City of 70,000, southeastern U. S., seeks qualified health commissioner between the ages of 30 and 45, draft exempt. Salary $4,500 plus auto allowance of $300 per year. **Box V,** Employment Service, A.P.H.A.

Assistant Sanitarian in well established Ohio department of health. Minimum experience 2 years required. Merit system prevails. Salary $1,800–$2,400. Write **Box K,** Employment Service, A.P.H.A.

Wanted: Bacteriologist to conduct virus laboratory in the Laboratory Section of the Health Division, City of St. Louis. Applicant must have graduate degree with research and practical experience in virology. Salary range from $220 to $360 a month, depending upon ability. Position under Civil Service. Write **Box W,** Employment Service, A.P.H.A.

Wanted: Statistical clerk, preferably with college degree and experience in health education, to study and analyze vital statistics in suburban and rural county adjacent to Washington. Special emphasis on relation to health department services and participation in Health Honor Roll. Address V. L. Ellicott, M.D., Dr.P.H., Montgomery Co., Rockville, Md.

Wanted: Medical Social Worker for Dept. of Health, Peoria, Ill. Address Director Maternal and Child Health, Dept. of Health, Peoria, Ill.

Wanted: Physician in eastern city of 200,000 population as Director of Bureau of Maternal and Child Hygiene. Salary $4,500–$5,031, plus cost of living adjustment. Address **Box C,** Employment Service, A.P.H.A.

Wanted: Physician (male), American citizen, draft exempt, trained in pediatrics, for a 3 year position as chief resident and research assistant in fine pediatric tuberculosis hospital, New York. Good salary and maintenance. Only one intensely interested in research need apply. Send full details of qualifications and photo-

graph. **Box R**, Employment Service, A.P.H.A.

Wanted: X-ray technician to travel with portable x-ray unit taking chest x-rays at tuberculosis case finding clinics. Includes both industrial and school surveys. Salary $35 per week plus travel and maintenance when away from headquarters. Address **Box M**, Employment Service, A.P.H.A.

Wanted: Resident physician for plant in South America. Must have thorough knowledge of malaria, tropical medicine, and vector control. Must be eligible for licensure in British Colony. Address **Box H**, Employment Service, A.P.H.A.

Physician wanted as Director of Maternal and Child Health in western county health department. Preferably with training in pediatrics and venereology. Some venereal disease control work also. Man preferred but woman considered. Must be in good health. Salary $4,500 per year with car and expenses furnished. Position for duration of war. Address **Box S**, Employment Service, A.P.H.A.

Tuberculosis Association in large western city seeks a trained and experienced health education director, a director of medical social work, and a public health nurse supervisor. Attractive positions now open in agency with a dynamic program closely related to official groups. Address **Box D**, Employment Service, A.P.H.A.

U. S. Indian Service seeks physicians for service in the United States and Alaska. Address Office of Indian Affairs, Health Division, Merchandise Mart, Chicago 54, Ill. Application blanks will be furnished upon request.

Wanted: Medical technologists, also bacteriologist for 550 bed approved California hospital. Give full particulars and state salary desired. Address W. O. Brown, M.D., Kern General Hospital, Bakersfield, Calif.

Wanted: Medical technologist, woman, trained in bacteriology of milk and water, diagnostic cultures, routine blood chemistry and tissue work—paraffin and frozen sections. County position under Civil Service located in the East. Salary to be arranged. Write **Box L**, Employment Service, A.P.H.A.

Wanted: M.D., instructor in preventive medicine and public health, with interest particularly in biostatistics and industrial hygiene. Salary approximately $4,000. Write **Box T**, Employment Service, A.P.H.A.

Wanted: Competent, thoroughly trained bacteriologist, woman or draft exempt man, to take complete charge of splendidly equipped small industrial laboratory, Connecticut location, country environment, pleasant surroundings, excellent working and living conditions. This is a permanent post-war position. Write full details including minimum salary requirement to start in first letter. All letters including adequate vitae and photo will be promptly acknowledged. Write **Box A**, Employment Service, A.P.H.A.

St. Louis, Mo., Health Division, Industrial Hygiene Service, seeks two industrial hygienists, either engineers or chemists. Salaries $225 to $250 per month depending on qualifications and experience, plus travel allowances. Address Robert M. Brown, Public Health Engineer, 64 Municipal Courts Bldg., St. Louis 3, Mo.

FOR OTHER POSITIONS AVAILABLE WRITE EMPLOYMENT SERVICE, AMERICAN PUBLIC HEALTH ASSOCIATION, 1790 BROADWAY, NEW YORK 19, N. Y.

In view of the current active demand for trained and experienced persons in public health, it is suggested that prospective employers communicate directly with the Employment Service, American Public Health Association, 1790 Broadway, New York 19, N. Y., for up-to-date lists of applicants.

POSITIONS WANTED

ADMINISTRATIVE

Physician, age 37, M.D. Iowa, Dr.P.H. Harvard, specializing in tuberculosis, seeks position as medical director of a sanatorium or a state bureau of tuberculosis. Exempt from military service. **A-476**

Physician, M.D. University of Arkansas, M.P.H. Harvard, experienced as county health officer. **Age 35.** Will consider position as county or city health officer or director of a bureau. **A-506**

Physician, M.D. Yale, with private practice industrial medicine. Age 39 and draft exempt. Seeks opportunity as public health physician. **A-505**

Woman physician, experienced in pub-

lic health education and school health service administration and supervision, seeks full- or part-time position, preferably southeastern New York State. **A-511**

HEALTH EDUCATION

Woman with background of health education and public health nursing, experienced as teacher, supervisor, and writer, seeks teaching position of responsibility. **H-507**

Health educator with Master's degree in public health and some experience. Prefers position in official agency. **H-510**

LABORATORY

Research bacteriologist. Unusually trained and experienced woman bacteriologist and serologist now occupying responsible position in state laboratory seeks research work of permanent character. **L-468**

Water chemist, bacteriologist. M.S. degree in Sanitary Chemistry. Age 36, draft exempt. Eight years' experience in state laboratory working on water, milk and sewage. Prefers Midwest or Pacific Northwest location. **L-469**

ENGINEER

Well qualified public health engineer seeks responsible position in New York metropolitan area. **E-480**

MISCELLANEOUS

Public Health Nurse. B.S. in nursing, William and Mary College, age 53, seeks position as coördinator of public health nursing, educational director, or director student nurse public health program. Prefers Middle Atlantic States. **M-452**

NEWS FROM THE FIELD

OCD CHANGES CHIEF MEDICAL OFFICERS

The Office of Civilian Defense in Washington has announced that George Baehr, M.D., Medical Director (R) U.S.P.H.S., retired on March 1 after 2½ years of service as Chief Medical Officer of the OCD. He will be succeeded by W. Palmer Dearing, M.D., U.S.P.H.S., who has been assistant chief medical officer since the establishment of the Medical Division of the OCD.

Dr. Baehr, in 1941, resigned a reserve commission in the Army to accept a commission as Medical Director in the U. S. Public Health Service for assignment to the newly created Office of Civilian Defense to organize its medical division. Under his direction a staff of technical experts was assembled, regional medical and sanitary engineering offices were established, and an emergency medical service was organized in each state and local community throughout the country. An organization for protection against war gases was set up in the coastal states and in the major industrial centers in the interior. A program of protection and mutual aid for water supply systems and sanitation facilities was established in all states.

According to the OCD, the Medical Division has established a nation-wide system of casualty receiving hospitals, 321 potential emergency base hospitals in 20 coastal states, 180 hospital blood and plasma banks, reserve depots of dried and frozen plasma in 400 cities, more than 120 affiliated hospital units, and 80 emergency nursing units. In recognition of Dr. Baehr's services to the hospitals of the country in time of war, the American Hospital Association at its recent annual meeting voted a special citation to Dr. Baehr and elected him to honorary membership.

NEW OFFICERS OF PENNSYLVANIA PUBLIC HEALTH ASSOCIATION

At a meeting on January 25, the Pennsylvania Public Health Association elected the following officers:

Honorary President—A. H. Stewart, M.D., Harrisburg
President—Henry J. Benz, M.D., Pittsburgh
President-Elect—Harriet L. Hartley, M.D., Philadelphia
Vice-President—Richard P. Lienhardt, V.M.D., Wayne
Secretary-Treasurer—C. E. Houston, Washington
Representative to A.P.H.A. Governing Council—W. W. McFarland, M.D., Pittsburgh

U. S. PUBLIC HEALTH SERVICE AID IN THE RELOCATION OF PHYSICIANS AND DENTISTS

The following is an official statement published at the request of the U. S. Public Health Service:

During its last session, Congress passed a deficiency appropriation bill which included an authorization to the U. S. Public Health Service to enter into agreements with and make certain payments to physicians and dentists to relocate in communities needing medical and dental services. On December 23, 1943, this measure became Public Law 216, 78th Congress.

The law is designed to provide relief to those areas which for various reasons have undergone the hardship of inadequate medical and dental care. Many of these communities have lost their doctors and dentists to the armed forces.

The law also provides an opportunity for the physician or dentist who has wanted to set up practice in another community, but has hesitated because of the financial risk of those first months

during which he and the families in the new town are becoming acquainted. Now, with a 3 month allowance assured and with transportation paid for him, he can make that move with less fear of financial loss.

Any municipality, county, or other local subdivision of government may file an application to secure a physician or dentist. Application forms are secured from the state health department. The application is executed by the legally authorized representative of the community (the city manager, mayor, chairman of the county board of supervisors, county judge, etc.). The application is sent, with the community's remittance of $300, made payable to the Treasurer of the United States, to the state health department for approval. When this approval is given, the state health department forwards the community's application and $300 to the U. S. Public Health Service.

Upon the receipt of the community's application and payment of $300, the Public Health Service can enter into an agreement with a physician or dentist who has a permit to practise in the state in which the applicant community is located, who agrees to practise in that community for at least one year, and who is acceptable to the community. The costs of transportation of the physician or dentist, his family and household effects, are paid. In addition, a monthly allowance of $250 a month for 3 months will be paid to the doctor. Of the total cost of transportation and relocation allowance, 75 per cent is contributed by the U. S. Public Health Service; 25 per cent by the community to which the doctor is relocated.

The total relocation cost to the community will be about $300. If the community's obligation should exceed $300, the balance due must be remitted to the U. S. Public Health Service upon the latter's request. If it is less than $300, the excess will be refunded to the community.

After a written agreement between an individual physician or dentist and the U. S. Public Health Service has been concluded, the first monthly relocation allowance to the physician or dentist accrues from the date of the latter's arrival at the new location. The second and third payments are made at the end of the second and third months.

Travel and transportation costs can be paid in either of two ways. The physician or dentist who has a written agreement with the Public Health Service can apply to the latter for Government transportation requests, and Government bills of lading. If this arrangement is carried out, the Government is billed and the physician or dentist does not have to use his own funds to cover this expense. Or, if he prefers, he may pay travel and transportation himself and be reimbursed for actual and necessary expense upon presentation of his claim to the Public Health Service. These claims must be supported by receipts in so far as possible.

The physician or dentist relocating under agreement with the Public Health Service remains a private, self-employed professional individual. His relation to the community is the same as that of any other private doctor except that he must practise in the new location at least one year. The Public Health Service simply assists in getting together the community that needs a physician or dentist with the professional man who has the necessary permit to practise and who agrees to serve that community in his professional capacity.

The purpose of this relocation plan is to mitigate the doctor shortage, which in some places has been created, in others intensified, by military absorption of medical and dental personnel. The success of the plan will depend in large measure upon the response of

the individual doctor, the initiative of the needy community, and, above all, upon the extent to which the wishes of the applicant communities coincide with the preference of the doctors who volunteer to serve under this plan.

HOSPITAL MEN VOLUNTEERS

The U. S. Office of Civilian Defense in coöperation with the American Hospital Association has published a bulletin for hospital administrators with suggestions for solving serious man power shortage problems and the cultivation of hospital men volunteers. This OCD publication 5013 should be used with OCD publication 3632, A Guide for Local Defense Councils for training volunteers for war services. Requests for copies should be addressed to the U. S. Office of Civilian Defense, Washington.

DELAMAR INSTITUTE, NEW YORK, TO EXPAND TROPICAL MEDICINE

Dr. Harry S. Mustard, the Director of the DeLamar Institute of Public Health, Columbia University, New York, recently announced plans to establish a center in tropical medicine involving new building facilities and expanded personnel with additional laboratories and equipment.

With hundreds of thousands of troops in tropical areas who are threatened by infections and epidemics, an acute need has developed for personnel trained in methods for fighting tropical diseases. Dr. Mustard said: "Alliances, treaties, national policies and trade interests are more than ever carrying Government officials, business men, advisers, physicians and technicians into places whose names they could not have pronounced before the war. They go and will continue to go by ships and airplanes to the uttermost corners of the earth."

According to Dr. Mustard, a substantial temporary grant has been received from the Josiah Macy, Jr., Foundation which will be used in the study of tropical medicine under the new program. A further grant has been received from the John and Mary Markle Foundation for research in filariasis, and provisions have been made for increased instruction in tropical medicine for undergraduate medical students.

REORGANIZATION OF U. S. PUBLIC HEALTH SERVICE STAFF

Surgeon General Thomas Parran of the U. S. Public Health Service recently announced the following appointments authorized under legislation affecting the Service:

Assistant Surgeon General Lewis R. Thompson, in charge of the Bureau of State Services
Assistant Surgeon General Rolla E. Dyer, director of the National Institute of Health
Assistant Surgeon General Ralph C. Williams in charge of the Bureau of Medical Services
Assistant Surgeon General (Dental) William T. Wright, Jr., chief of the Dental Division
Assistant Surgeon General (Sanitary Engineering) John K. Hoskins, chief of the sanitary engineering division
Medical Director Paul M. Stewart, chief Division of Commissioned Officers
Medical Director Lawrence Kolb, chief, Mental Hygiene Division
Medical Director Joseph W. Mountin, chief States Relations Division
Medical Director William F. Ossenfort, chief Hospital Division
Medical Director Gilbert L. Dunnahoo, chief Foreign Quarantine Division

HERMANN M. BIGGS MEMORIAL LECTURE

The Hermann M. Biggs Memorial Lecture, held annually in Hosack Hall, New York Academy of Medicine, under the auspices of the Committee on Public Health Relations, will be delivered this year on Thursday, April 6, at 8:30 P.M., by Wilbur A. Sawyer, M.D., Director of the International Health Division of the Rockefeller Foundation. The subject of the lecture will be "International Health." This lecture is open to the general public.

NORTH DAKOTA WORKERS ATTEND SCHOOL ADMINISTRATORS INSTITUTE

The North Dakota State Department of Health, Bismarck, has announced that 30 North Dakota school administrators from the University, teachers colleges, junior and senior high schools, as well as 3 members of the staff of the State Department of Public Instruction, attended an Institute in Health Education for school administrators held at the Center for Continuation Study, University of Minnesota, recently. The arrangements for the Institute were under the direction of Ruth E. Grout, Ph.D., of the College of Education and the Department of Preventive Medicine and Public Health of the University of Minnesota.

DR. RECIO APPOINTED CUBAN MINISTER OF HEALTH

President Fulgencio Batista on March 6 announced the appointment of Dr. Alberto Recio Forns, as Minister of Health to replace Dr. Juane Portuondo Domenech, resigned. Dr. Recio for several years has been technical chief of medical services in the Ministry of Health and is well known to his North American colleagues from his attendance at annual meetings of the Association.

PROGRESS IN STUDENT NURSE RECRUITMENT

A coöperative campaign by nurses, hospital administrators, educators and civic leaders to meet the year's quota of 65,000 new student nurses was mapped out at a meeting on February 24 of the recently reorganized Committee on Recruitment of Student Nurses, called by the National Nursing Council for War Service.

Dr. Thomas Parran, Surgeon General, U. S. Public Health Service, in a message read by Lucille Petry, a member of the committee, called for "the largest fall classes in the history of most schools of nursing, if known national war needs are to be met."

Pointing out that the 65,000 quota was an absolute minimum based on the number of students who could be admitted to schools, Miss Petry stated that in order to reach that goal, 23,000 students would have to be enrolled between January 1 and May 30, and another 5,000 in June classes. Summer and fall admissions in 1943, she said, had reached a total of 41,270. The shortages hampering more rapid expansion of schools of nursing, namely, shortage of clinical facilities, of well qualified instructors, and of housing facilities, were not insurmountable, in her opinion, and steps were being taken to overcome them as soon as possible.

More than 1,100 schools of nursing have applied for admission to the U. S. Cadet Nurse Corps program and approximately 1,000 units have already been approved. These are distributed fairly evenly throughout the country. U. S. Cadet Nurses now number 92,000 enrolled in all classes in schools of nursing, about half of these being new enrollees.

CALIFORNIA OFFERS COURSE FOR SANITARIANS

The School of Public Health, University of California, Berkeley, has announced that 25 sanitarians are currently in attendance at the special training course for sanitarians which began on March 3 and will run through the month of May. The course will include public health administration and organization, communicable diseases and their control, general epidemiology and public health statistics, together with sanitary science and sanitary inspection. Arrangements for the course are under the direction of Dr. Walter H. Brown, the Acting Dean. W. S. Mangold is supervising the instruction.

WILLIAM J. ORCHARD HONORED

William J. Orchard, General Manager of Wallace & Tiernan, Inc., was designated as the "Outstanding Citizen for the year 1943" in a citation from the Chamber of Commerce and Civics of the Oranges and Maplewood, New Jersey, presented at the annual dinner of the Chamber on February 15.

This citation supplemented the one given him on December 7, 1943, by the Belleville Manufacturers Association, Inc., of Belleville, N. J., in which city the Wallace & Tiernan plant is located. The Belleville citation, the first one awarded by the Association, was given on the occasion of its twelfth anniversary, and states that Mr. Orchard's "services to management and labor in our communities in World War II have been of paramount importance to the economic, industrial, and civic life of this area."

Mr. Orchard is General Chairman of the Community Manpower Mobilization Committee, a committee of businessmen and industrialists which he formed in order to solve the labor needs of the Newark Area of the War Manpower Commission. It is reported that the results have earned praise from high government officials, that war production in the area has increased, labor turnover has decreased, and thousands of new people have gone to work in war industry.

INDUSTRIAL HYGIENE CONFERENCE

The Second War Conference of industrial physicians, industrial hygienists and industrial nurses will be held in St. Louis, Mo., May 8–14, at the Hotel Jefferson. The participating organizations are: American Association of Industrial Physicians and Surgeons, American Industrial Hygiene Association, National Conference of Governmental Industrial Hygienists, and American Association of Industrial Nurses.

PERSONALS

Central States

FLOYD C. BEELMAN, M.D.,† with the Assistance of HARRY R. ROSS, M.D.,† Topeka, Kan., is directing the work of the Division of Maternal and Child Health of Kansas State Board of Health, pending the appointment of a person to succeed William Fred Mayes, M.D., resigned. Dr. Beelman is Secretary of the State Board.

ALBERT FISHER, M.D., North Judson, Ind., has been appointed Health Officer of Starke County, succeeding DR. WILLIAM J. SOLT, San Pierre.

ESTHER FRENDBERG, Nutritionist for the North Dakota State Department of Health since June 1, 1943, has been appointed Executive Secretary of the State Nutrition Council of the North Dakota Defense Council. Miss Frendberg has been granted a leave of absence to accept this post. She has been a home economics instructor in Mohall and Mandan High Schools in North Dakota since graduating from the North Dakota Agricultural College.

DOUGLAS H. FRYER, M.D., D.P.H.,† formerly Director of the Bay City-County Health Department, has been appointed Field Medical Director and Assistant Director of the Bureau of Local Health Services of the Michigan Department of Health, Lansing.

CLARENCE A. HARTLEY, SR., M.D., has been appointed Health Officer of Evansville and Vanderburgh County, Ind.

WILLIAM H. HEADLEE, PH.D., recently appointed Head of the Division of Tropical Medicine and Parasitology at Indiana University School of Medicine, Indianapolis, Ind., left in March to conduct a study of tropical

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* Fellow A.P.H.A.
† Member A.P.H.A.

diseases in Guatemala, Honduras and Costa Rica. Dr. Headlee was chosen for the work by the Association of American Medical Colleges, the study to be financed by the Markle Foundation in coöperation with the Army Medical Corps.

OSCAR S. HELLER, M.D., Greenfield, Ind., has resigned as Health Officer of Hancock County, Ind.

WALLACE D. HUNT, M.D.,† of the Reserve staff, U. S. Public Health Service, has been assigned to the Division of Public Health, Minneapolis, Minn., to assist F. E. HARRINGTON, M.D.,† the Commissioner of Health.

DAVID LITTLEJOHN, M.D.,* Saulte Ste. Marie, Mich., for the past 7 years Director of the Chippewa County Health Department, became Director of the Wayne County Health Department.

LEWIS A. MOORE, M.D., has been appointed Health Officer of Monroe, Wis.

WILLIAM SAMBORSKI† of the Detroit Department of Health has been appointed to conduct a cross-connection survey for the City of Ann Arbor, Mich. This survey is sponsored jointly by the Water Department and the Department of Public Works.

R. M. SORENSEN, M.D.,* who is in charge of the Division of Venereal Disease Control in the Kansas State Board of Health, Topeka, has been appointed acting secretary of the Kansas Public Health Association in the place of FRED MAYES, M.D.,† resigned, who has joined the staff of the U. S. Children's Bureau, Washington.

WILLARD C. SUMNER, M.D., has been appointed Health Officer of Edgerton, Wis.

Eastern States

JAMES D. LEWIS, M.D., of Scranton, Pa., has been appointed Health Director of Lackawanna County, succeeding WILLIAM T. DAVIS, M.D.

HENRY E. MELENEY, M.D.,* Hermann M. Biggs professor of preventive medicine, New York University College of Medicine, recently returned from the Caribbean area on a trip during which he lectured in the School of Tropical Medicine at San Juan, Puerto Rico, and addressed the Puerto Rico Medical Association on advances in the treatment of malaria. Returning through Cuba, Dr. Meleney addressed a special meeting of the Cuban Public Health Association, affiliated with the A.P.H.A., and the Cuban Society of Preventive Medicine on Inter-American Cooperation in Medicine and Public Health.

WARD L. OLIVER, M.D., Cobleskill, N. Y., has been appointed Health Director of District No. 3 with headquarters at Point Pleasant, W. Va.

MEYER SOLIS-COHEN, M.D., has been appointed Assistant Director of Public Health of Philadelphia, Pa.

Southern States

SAMUEL L. ANDELMAN, M.D.,† has been appointed in charge of the Johnson County Health Department, Paintsville, Ky., succeeding DR. EDWARD W. KISSELL, resigned.

SOLOMON J. AXELROD, M.D.,† has resigned as Director of the Division of Preventable Diseases of the Chattanooga, Tenn., and Hamilton County Department of Health to accept a commission as passed assistant surgeon in the U. S. Public Health Service.

WILLIAM ROSS CAMERON, M.D.,* Portsmouth, Va., has been appointed Health Officer for Charlotte, N. C.

DEAN A. CLARK, M.D., Surgeon, U. S.

* Fellow A.P.H.A.
† Member A.P.H.A.

Public Health Service, Washington, has been appointed Chief Medical Officer of the Office of Vocational Rehabilitation, as recently announced. This new office is a part of the Federal Security Administration. Dr. Clark will have charge of the physical rehabilitation section which is authorized under the Barden-La Follette Act to promote medical care for the physically handicapped. Under the act the federal government carries the full cost of rehabilitating war disabled civilians and half the cost of rehabilitation for other civilians.

JAMES M. CORAM, M.D.,† Beckley, W. Va., has resigned as Director of the Raleigh County Health Department to engage in the practice of medicine at Edwight.

SARAH S. DEITRICK, M.D.,* Washington, D. C., who for some years has been Regional Medical Consultant for the Children's Bureau, has been made Assistant Director for Maternal and Child Health in the Division of Health Services of the Children's Bureau. WILLIAM SCHMIDT, M.D.,* has been assigned as Medical Consultant in the Children's Bureau for the New England region, succeeding Dr. Deitrick.

HARRY C. GALEY, M.D., was recently appointed Health Officer of Key West, Fla.

VICTOR P. GENGE, M.D., Director of the Lake County Health Department, Tavares, Fla., has been appointed in charge of the Highlands-Glades Health Unit, succeeding DR. PAUL J. COUGHLIN, Sebring, Fla.

JOHN W. GILMORE, M.D., of Wheeling, W. Va., has been appointed Director of the City-County Health Department in Wheeling to succeed DR. ANDREW J. NICHAUS, resigned.

WILLIAM G. MORGAN, M.D.,† has been appointed Director of the Clark County Health Department, Winchester, Ky.

FRANK M. STEAD,* Associate Professor of Sanitation at the School of Medicine at Galveston, University of Texas, according to *Science*, has resigned to take charge of studies on industrial hygiene for the California State Board of Health at Berkeley. His successor is JOE B. WINTON, formerly associated with the Harris County Health Department.

JAMES H. WELLS, M.D., Pineville, Ky., has resigned as Health Officer of Belle County, Ky.

EDGAR H. WILLARD, M.D., DR.P.H.,† Berkeley Springs, W. Va., has been appointed as part-time Health Officer for Morgan County.

ROBERT D. WRIGHT, M.D.,† former venereal disease consultant attached to the North Carolina State Board of Health, has been assigned as Medical Officer in charge of the new Kanawha Valley Medical Center at South Charleston, W. Va.

MARTIN D. YOUNG, Sc.D.,† Senior Parasitologist, National Institute of Health, has been commissioned as Sanitarian (R) in the U. S. Public Health Service. Dr. Young is in charge of the Malaria Research Laboratory of the National Institute of Health located at Columbia, S. C., and also of the newly organized "Imported Malaria Studies" program.

Western States

J. L. JONES, M.D., DR.P.H.,* Director of the Division of Industrial Hygiene in the Utah State Department of Health, Salt Lake City, and formerly State Health Commissioner of Utah, has resigned to become Chief of Medical Services of the Washington State Department of Health, Seattle.

LYNN J. LULL, M.D.,* has been appointed Director of Local Public Health Services in Idaho. He was

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* Fellow A.P.H.A.
† Member A.P.H.A.

formerly director of the Division of Venereal Disease Control for the Colorado State Division of Public Health, Denver, Colo.

Canada

DR. JULES ABADIE, former Minister of Justice, National Education and Public Health of the French Committee for National Liberation, arrived in New York on February 15 for a study of post-war health organization in the United States and Canada, according to the press.

Dominican Republic

L. F. THOMEN, DR.P.H., of Trujillo City, Dominican Republic, has been appointed as Undersecretary of State for Health and Public Welfare.

Foreign

DR. J. ALLEN SCOTT, senior statistician in the Division of Vital Statistics in the U. S. Bureau of the Census, formerly on the staff of the Rockefeller Foundation in Egypt, has been appointed Associate Professor of Preventive Medicine in the field of statistics and epidemiology at the University of Texas School of Medicine, Galveston, according to *Science*.

Death

ARTHUR LEDERER, C.H.E., M.D., died in Chicago, October 14, 1943, after a long illness. He served twenty-five years ago as editor of the Laboratory Section, *American Journal of Public Health*. After serving for some years with the Hygienic Laboratory of the U. S. Public Health Service he joined the Veteran's Bureau organization in the fields of roentgenology and pathology.

CONFERENCES AND DATES

American Home Economics Association. The Stevens Hotel, Chicago, Ill. June 20–23.

American Medical Association. Chicago, Ill. June 12–16.

American Public Health Association—Second Wartime Public Health Conference and 73rd Annual Business Meeting. Hotel Pennsylvania, New York, N. Y. October 3–5.

American Water Works Association—

Illinois Section—Hotel Pere Marquette, Peoria, Ill. April 11–13.

Indiana Section—Antlers Hotel, Indianapolis, Ind. April 13–14.

Canadian Section—General Brock Hotel, Niagara Falls, Ont. April 19–21.

Michigan Section—Otsego Hotel, Jackson, Mich. April 26–28.

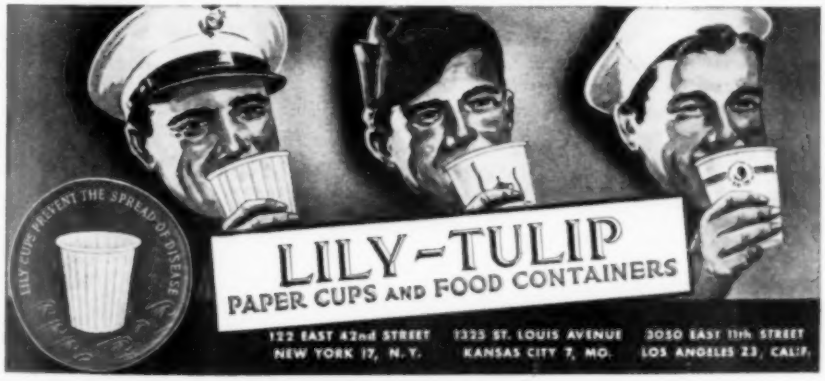
New York Section—Hotel Utica, Utica, N. Y. April 27–28.

Montana Section—Baxter Hotel, Bozeman, Mont. May 5–6.

Southeastern Section — Poinsett Hotel, Greenville, S. C. May 8–10.

New Jersey Section — Trenton, N. J. May 11.

* Fellow A.P.H.A.
† Member A.P.H.A.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American Water Works Assn. (Cont.)

Pacific Northwest Section—Olympian Hotel, Olympia, Wash. May 12–13.

Ohio Section—Hotels Fort Hayes and Chittenden, Columbus, Ohio. May 18–19.

Annual Conference, June 13–16.

Canadian Medical Association. Toronto, Canada. May 22–26.

Institute of Food Technologists—Fifth Annual Meeting. Edgewater Beach Hotel, Chicago, Ill. May 29–31.

National Conference of Social Work. Cleveland, Ohio. May 21–27.

National Fire Protection Association. Philadelphia, Pa. May 8–11.

National Negro Health Week—Sponsored by the U. S. Public Health Service. April 2–9.

National Posture Week. May 1–6.

National Probation Association. Hotel Statler, Cleveland, Ohio. May 19–20.

National Restaurant Week. May 8–14.

National Tuberculosis Association. Stevens Hotel, Chicago, Ill. May 10–12.

Second War Conference on Industrial Medicine, Hygiene and Nursing. Hotel Jefferson, St. Louis, Mo., May 8–14.

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Dirty, fat-soaked rubber wears out quickly . . . cannot easily be replaced. Dirty rubber also makes a perfect breeding place for milk-spoiling bacteria. To preserve rubber . . . to protect milk quality . . . inflations and tubing should be cleaned the easy way with Diversey Rub-R-Kleen. Dissolves quickly in water . . . does not lose its strength on standing . . . cleans thoroughly. No need to make up a stock solution. Excellent for washing out vacuum lines. For further information write to The Diversey Corporation, 53 W. Jackson Blvd., Chicago 4, Ill.

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A series of approximately 150 2x2" (35mm) Kodachrome transparencies (lantern slides) made with the cooperation of Dr. Henry E. Meleney and Dr. Harry Most, Department of Preventive Medicine, New York University College of Medicine. Slides Nos. MT 45, 46, 47 are from the Army Medical Museum, Washington, D. C.

Partial list of slides which are ready:

MT 1. Yellow Fever—Liver lobule showing midzonal necrosis H&E x100-300
MT 6. Plague—exudate in alveoli H&E x500
MT 8. Plague bacilli in smear of spleen x1200
MT 10. Bacillary dysentery—smear of exudate in stool. Iron Htx x500
MT 25. Relapsing fever—spirochaetes smear of blood—giemsa x1000
MT 30. Histoplasmosis—section of lung, liver or spleen showing Histoplasma in macrophages H&E x1000
MT 30a. Histoplasmosis—smear in blood
MT 39. Actinomycosis—section of lung showing rays H&E x1000
MT 40. Rhinosporidium seeberi, nasal polyp
MT 45. Plasmodium vivax; life history from drawings
MT 46. Plasmodium malariae life history from drawings
MT 47. Plasmodium falciparum life history from drawings
MT 56. Malaria—section of brain P. falciparum—capillaries, l.p. H&E x500
MT 56a. Malaria—section of brain P. falciparum—capillaries, h.p. x1200
MT 58. Malaria—cocysts Htx x100
MT 60. Malaria—sporozoites giemsa x1000
MT 65. African trypanosomiasis—section of brain—perivascular infiltration H&E x100
MT 78. Trypanosoma lewisi—blood of rat—smear giemsa x1000
MT 80. T. cruzi—smear of culture—giemsa x1000
MT 80a. T. cruzi in muscle
MT 85. Leishmaniasis—L.donovani—section of liver Kala Azar H&E x1000
MT 88. Leishmaniasis—L.donovani—smear of bone marrow, giemsa x1000
MT 88a. Leishmaniasis—L.donovani—blood smear x1000
MT 92a. Leishmaniasis—L. tropica plate culture
MT 105. E. histolytica—abscess of liver H&E x100 or less
MT 107. E. histolytica—ulcer of skin low power H&E x50
MT 107.1 E. histolytica—invading skin x100
MT 107.2 E. histolytica—in lung x300
MT 107a. E. histolytica—in lung x60
MT 107b. E. histolytica—invading fat (skin)
MT 109. E. histolytica—motile—smear feces—Iron Htx H&E x1000 or 500
MT 127. Bacillary dysentery, section of colon H&E x10
MT 130. Wuchereria bancrofti—Microfilaria in blood Htx x500
MT 131. Wuchereria malayi—Microfilaria in blood x400

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